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REPORT

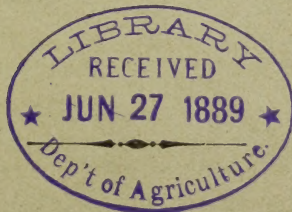
OF THE

ORNITHOLOGIST AND MAMMALOGIST,

C. HART MERRIAM, M. D.,

FOR

THE YEAR 1888.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1889.

Compliments of

J. M. RUSK,

Secretary of Agriculture.

AUTHOR'S EDITION.

FROM THE ANNUAL REPORT OF THE DEPARTMENT OF
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1889.

TO THE HONORABLE SENATE OF THE UNITED STATES
IN SENATE

REPORT

OF THE COMMISSIONERS OF THE GENERAL LAND OFFICE
IN RESPONSE TO A RESOLUTION OF THE SENATE

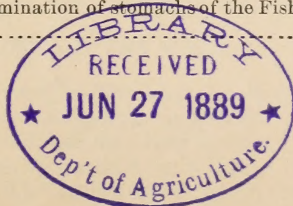
PASSED MAY 15, 1870

WASHINGTON

PRINTED BY THE SENATE PRINTING OFFICE
1871

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REPORT OF THE ORNITHOLOGIST AND MAMMALOGIST.

WASHINGTON, D. C., *January*, 1889.

SIR: I have the honor to submit herewith my third annual report upon the operations of the Division of Economic Ornithology and Mammalogy, covering the year 1888. It consists of five parts, as follows: (1) Scope of the work; (2) methods of inquiry; (3) statement of work done during the year; (4) the geographical distribution of species; and (5) special reports embodying results of investigations.

Respectfully,

C. HART MERRIAM,
*Chief of Division of
Ornithology and Mammalogy.*

Hon. NORMAN J. COLMAN,
Commissioner of Agriculture.

In my last report two bulletins were mentioned as ready for the printer. One of these, on the English Sparrow in America, is still in the hands of the Public Printer. The other, on Bird Migration in the Mississippi Valley, was issued in November, 1888. It is a compact octavo volume of 313 pages, accompanied by an admirable colored altitude map of the Mississippi Valley, showing in different tints the contours of 100, 500, 1,000, and 2,000 feet, and also the position of the observation stations. The publication of this work is an event of much importance both to the Department of Agriculture and to the science of ornithology. Its distribution to the regular observers of the Division has resulted in the receipt of letters from hundreds of persons desirous of securing it, many of whom have volunteered their services as observers; and it has given a great stimulus to the study of ornithology in the region of which it treats—a region covering more than one-third the total area of the United States, and including considerably more than half the species and subspecies of birds known to inhabit North America. It affords a more substantial foundation for the detailed study of the distribution and migration of birds than exists in any other portion of the world.

SCOPE OF THE WORK.

The scope of the work of this Division, as defined by act of Congress, is, "the promotion of economic ornithology and mammalogy, an investigation of the food habits, distribution, and migrations of North American birds and mammals, in relation to agriculture, horticulture, and forestry." The function of the Division, then, consists

in the collection of facts relating to the above subjects, and in the arrangement and publication of these facts in the form of special reports and bulletins. The field thus outlined is so large, and the amount of money appropriated for the work so small, that it is impossible to cover more than a very limited portion of the ground; hence of necessity the investigations thus far made have been along special lines. At the same time, since it costs no more to ask ten questions than it does to ask one, it has been the policy of the Division in preparing its circulars and schedules to request more information than can be put to immediate use, hoping that at some future time it may be possible to elaborate and publish the whole. The result of this course is the receipt of an immense mass of material of great value, which the limited force of the Division is wholly unable to handle.

METHODS OF INQUIRY.

The principal ways of gathering information are, (a) by personal observation on the part of the staff of the Division and its special field agents; (b) by the co-operation and assistance of farmers and others in extending these observations over the entire country; (c) by the collation of what has been already published on the subject; and (d) by examination of stomach contents in the laboratory. With these objects in view general circulars and schedules on the migration and geographical distribution of birds have been sent out twice each year, and special circulars, asking for detailed information on particular subjects, have been issued from time to time.

STATEMENT OF WORK DONE IN 1888.

The work of the Division during the year 1888 has been confined to the collection and elaboration of material relating to the general subjects already mentioned.

My last report contained tabulated results of the critical examination of more than a thousand stomachs of hawks and owls, prepared by Dr. A. K. Fisher, assistant ornithologist. The work in this direction has been continued during the past year, and the final results, together with copious notes on the distribution and food habits of the species concerned, will appear in a special illustrated bulletin already in an advanced stage of preparation.

Another assistant, Prof. Walter B. Barrows, has spent much time in the examination of the stomachs of crows, the results of which are incorporated in the present report.

In undertaking to identify the stomach contents of fruit-eating and seed-eating birds, it became evident at once that no substantial progress could be made without a reference collection of seeds, berries, and the pits of fruits. Such a carpological collection does not exist either in the Department of Agriculture or the United States National Museum. Therefore it has been necessary for members of the Division to collect this indispensable material in order to carry on the work of identifying the stomach contents of crows, blackbirds, and many other species.

Considerable progress has been made in arranging for publication the large amount of information in hand relating to the depredations of Blackbirds, but this work, as well as that relating to the Rice-bird or Bobolink, is held back temporarily for lack of sufficient competent field observation and experiment to complete the investigations and determine the economic status of the species.

Perhaps the most important feature of the work of the year has been the collection and partial arrangement of material for one or more bulletins on the Pocket Gophers and Ground Squirrels of the United States, an undertaking of surpassing importance to the agriculturists not only of the Mississippi Valley but of nearly the whole of the western two-thirds of the continent. The magnitude of the losses occasioned by these animals, and the imperative demand for remedies, are almost unknown in the Eastern States. During the past summer an energetic field agent has devoted much time to this work in Nebraska, Dakota, Wyoming, and Utah, and the chief of this Division visited parts of Montana, Washington Territory, Oregon, and California in order to study personally the different phases of the problem there presented, as well as the remedial measures employed by the inhabitants.

The attempt to remedy the Gopher evil by the award of bounties has proved as useless as in the case of the Rabbit plague and Sparrow scourge; and the persistency with which this method is resorted to shows the necessity for a compilation of bounty laws and their results, at least in the United States. Such a compilation was begun two years ago in connection with the Sparrow investigation, and has been continued since, its scope having been enlarged to cover all legislation directly affecting undomesticated birds and mammals. During the year 1888 letters have been written to all the county treasurers of Minnesota, Dakota, and Iowa, two hundred and eighty in number, asking if bounties were paid on Gophers, and, if so, requesting specific information as to the statute or ordinance under which said bounties were offered, the dates between which the law was held operative, and the amounts disbursed on account of each species. A synopsis of the information received in reply to these letters will appear in the Gopher bulletin.

A not unimportant incidental feature of the routine work of the Division consists in the identification of specimens of birds and mammals sent to the Department for this purpose. Among those received during the year 1888, in addition to those sent by private individuals scattered over the whole country, were small collections from the Geological and Natural History Survey of Canada (including several species new to science), and from the museum of Laval University at Quebec. The total number of specimens received for identification in 1888 considerably exceeded a thousand. The number is constantly on the increase, and it is hardly necessary to add that great good is done by thus diffusing among the people an accurate knowledge of the birds and mammals with which they are surrounded.

The routine work of the Division has been reduced to a system designed to expedite the various operations involved, and to facilitate reference to and future collation of the voluminous material collected; but the amount of office work largely increases from year to year, and has already assumed dimensions disproportionate to the working force.

General circulars and schedules relating to the migration and geographical distribution of North American birds are mailed semi-annually to nearly three thousand regular correspondents, and circulars on special subjects are prepared and sent out as occasion demands.

Scores of thousands of small birds are killed each year by striking the light-houses along the coasts and lakes of the United States and

Canada, and the keepers of these lights are requested to transmit to this Division full accounts of the phenomena accompanying such catastrophes, together with specimens (heads and wings) of the birds killed. The material thus contributed is sufficient in itself to occupy an assistant during the entire year, and when to this is added the equally valuable reports of many hundred voluntary inland observers throughout the United States and Canada, it will be seen that little can be accomplished with the present force of the Division, now almost exclusively occupied in the more purely economic phases of the work.

All information received, whether in reply to circulars or contributed independently, is indorsed with the name and address of its contributor, the date, and a brief statement of its contents; it is then filed and indexed for ready reference. Careful separation is made of notes relating to the different subjects under investigation in order to facilitate its ready access and arrangement for bulletins or reports on special species or groups of species. A record index of all matter received is kept on cards printed for that purpose, and arranged alphabetically according to localities. General interest in the practical work of the Division increases, and a very large item of office work is that which relates to the regular correspondence of the day. Upwards of three thousand letters were answered during the year 1888, many of which necessitated considerable research in order to answer the inquiries contained. All communications received are promptly acknowledged, and press copies are taken of all letters written.

CINCINNATI EXPOSITION.

In the summer and fall of 1888 an exposition, entitled the "Centennial Exposition of the Ohio Valley and Central States," was held at Cincinnati, Ohio, opening July 4 and closing November 8. As a part of the exhibit of the Agricultural Department this Division placed on exhibition a collection of the birds of prey of the United States. Through co-operation with the United States National Museum the series of species shown was very complete, nearly every known species of North American Hawk and Owl being represented by at least one specimen. In many cases the young as well as the adults were exhibited, and both sexes where the plumage of the male differs from that of the female. To each specimen was attached a large printed label, giving its common and scientific names, its distribution, and its food. Following is an example of one of these labels:

RED-TAILED HAWK.

Buteo borealis (Gm.).

Habitat.—Eastern North America to and including the Mississippi Valley; north to the Fur Countries; south through eastern Mexico to Guatemala.

Food.—Mice and other small mammals, toads, snakes, frogs, and crawfish, with an occasional chicken or small bird.

Of 311 stomachs examined, 258 contained mice and other mammals; 24, insects; 29, poultry or game birds; 35, other birds; 9, batrachians or reptiles; 4, offal; 3, crawfish; and 29 were empty. Two hundred and ten examined by the Division contained 270 mice.

The following species of birds of prey were exhibited:

Red-tailed Hawk (*Buteo borealis*).
 Western Red-tailed Hawk (*Buteo borealis calurus*).
 Harlan's Hawk (*Buteo harlani*).
 Swainson's Hawk (*Buteo swainsoni*).
 Zone-tailed Hawk (*Buteo abbreviatus*).
 Red-shouldered Hawk (*Buteo lineatus*).
 Red-bellied Hawk (*Buteo lineatus elegans*).
 White-tailed Hawk (*Buteo albicaudatus*).
 Broad-winged Hawk (*Buteo latissimus*).
 Rough-legged Hawk (*Archibuteo lagopus*).
 American Rough-legged Hawk (*Archibuteo lagopus sancti-johannis*).
 Squirrel Hawk (*Archibuteo ferrugineus*).
 Harris's Hawk (*Parabuteo unicinctus harrisi*).
 Mexican Black Hawk (*Urubitinga anthracina*).
 Goshawk (*Accipiter atricapillus*).
 Mexican Goshawk (*Asturina plagiata*).
 Osprey or Fish Hawk (*Pandion haliaetus*).
 Audubon's Caracara (*Polyborus cheriway*).
 Golden Eagle (*Aquila chrysaetos*).
 Bald Eagle (*Haliaeetus leucocephalus*).
 Duck Hawk (*Falco peregrinus anatum*).
 White Gyr Falcon (*Falco islandus*).
 Prairie Falcon (*Falco mexicanus*).
 Sparrow Hawk (*Falco sparverius*).
 Pigeon Hawk (*Falco columbarius*).
 Richardson's Merlin (*Falco richardsoni*).

Aplomado Falcon (*Falco fusco-cœrulescens*).
 Mississippi Kite (*Ictinia mississippiensis*).
 White-tailed Kite (*Elanus leucurus*).
 Swallow-tailed Kite (*Elanoides forficatus*).
 Everglade Kite (*Rostrhamus sociabilis*).
 Marsh Hawk (*Circus hudsonius*).
 Sharp-shinned Hawk (*Accipiter velox*).
 Cooper's Hawk (*Accipiter cooperi*).
 Great Horned Owl (*Bubo virginianus*).
 Western Horned Owl (*Bubo virginianus subarcticus*).
 Great Grey Owl (*Scotiaptex cinereus*).
 Snowy Owl (*Nyctea nyctea*).
 Barred Owl (*Syrnium nebulosum*).
 Spotted Owl (*Syrnium occidentale*).
 Barn Owl (*Strix pratensis*).
 Hawk Owl (*Surnia ulula caparoch*).
 Richardson's Owl (*Nyctala tengmalmi richardsoni*).
 Saw-whet Owl (*Nyctala acadica*).
 Screech Owl (*Megascops asio*).
 Flammulated Screech Owl (*Megascops flammeolus*).
 Ferruginous Pygmy Owl (*Glaucidium phalaenoides*).
 Pigmy Owl (*Glaucidium gnoma*).
 Elf Owl (*Micropallás whitneyi*).
 Burrowing Owl (*Speotyto cunicularia hypogæa*).
 Short-eared Owl (*Asio accipitrinus*).
 Long-eared Owl (*Asio wilsonianus*).

In addition to the series of birds of prey above enumerated, the Division put on exhibition the following other birds of known economic importance:

Bobolink (*Dolichonyx oryzivorus*).
 Cowbird (*Molothrus ater*).
 Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*).
 Red-winged Blackbird (*Agelaius phoeniceus*).

Rusty Blackbird (*Scolecophagus carolinus*).
 Purple Grackle (*Quiscalus quiscula*).
 Boat-tailed Grackle (*Quiscalus major*).
 Meadow Lark (*Sturnella magna*).
 Bob-white (*Colinus virginianus*).

A collection of mammals also was exhibited, comprising the following:

Opossum (*Didelphis virginianus*).
 Prairie Dog (*Cynomys ludovicianus*).
 Beechey's *Spermophile* (*Spermophilus grammurus beecheyi*).
 Richardson's *Spermophile* (*Spermophilus richardsoni*).
 Striped *Spermophile* (*Spermophilus tridecemlineatus*).
 Red Squirrel (*Sciurus hudsonius*).
 Muskrat (*Fiber zibethicus*).
 Meadow Mouse (*Arvicola riparius*).
 Rice Field Mouse (*Oryzomys palustris*).
 White-footed Mouse (*Hesperomys leucopus*).
 House Rat (*Mus decumanus*).
 Pocket Gopher (*Geomys bursarius*).

Gray Pocket Gopher (*Thomomys bulbivorus*).
 Porcupine (*Erethizon dorsatus*).
 Rabbit (*Lepus sylvaticus*).
 Short-tailed Shrew (*Blarina brevicauda*).
 Mole (*Scalops aquaticus*).
 Star-nosed Mole (*Condylura cristata*).
 Skunk (*Mephitis mephitis*).
 Badger (*Taxidea americana*).
 Weasel (*Putorius erminea*).
 Mink (*Lutreola vison*).
 Gray Fox (*Urocyon virginianus*).
 Red Fox (*Vulpes fulvus*).
 Prairie Wolf or Coyote (*Canis latrans*).
 Wildcat (*Lynx rufus*).

THE GEOGRAPHICAL DISTRIBUTION OF SPECIES.

The subject of the geographical distribution of species is one whose importance from the economic stand-point can hardly be overestimated, and one which ought to receive vastly more attention than can possibly be given it with the present limited means at the disposal of the Division. As the work of the geologist in his search for coal-fields and mineral wealth must be preceded by the work of the topographer, who furnishes him maps on which to indicate the position of his discoveries, so should the work of the economic zoologist be based on a knowledge of the geographic distribution of species. Were this knowledge available, both the agricultural experiment station and the intelligent farmer, wherever located, would derive great benefit therefrom, and millions of dollars now spent in indiscriminate experimentation might be saved.

In order to understand this fully it is necessary to bear in mind certain fundamental facts and laws. It is a matter of common observation that different groups of animals and plants inhabit different regions, even in the same latitude; that some forms are almost cosmopolitan in distribution, while others are restricted to very limited areas; that the ranges of very dissimilar species are often geographically coincident; and that, as a rule, animals inhabiting contiguous areas are more nearly related than animals inhabiting remote areas. The recognition of these facts early led to the attempt to divide the surface of the earth, according to its animal life, into "*faunal*" districts. The term "*fauna*" is used to designate the sum of the animal life of a region.

As a general rule it may be stated that the causes which govern the distribution of one group of land animals govern also the distribution of other groups of land animals, and of plants as well. It follows that a plant or animal found abundantly inhabiting any part of a particular faunal area will be found in other parts of that area, subject, of course, to local restrictions. The practical application of this knowledge is obvious.

In experimenting with a crop or garden plant of limited natural or artificial* range it would be necessary only to ascertain the extent of the faunal area in which it thrives in order to know just where it might be introduced with every prospect of success, soil and other local modifying influences being suitable. Moreover—and this perhaps is of even greater importance from the economic stand-point—the possession of this knowledge would indicate in advance the limits of the area outside of which the plant would not flourish. Plants are much more susceptible than animals to minor environmental influences, such as slight differences in altitude and soil, daily variations in temperature, humidity, exposure to sunlight, and protection from wind; therefore slight local conditions which would be unnoticed in the case of mammals or birds must be carefully considered in the case of plants.

This is but one of the ways in which a knowledge of the distribution of species would be of advantage to the practical agriculturist. It would help him also in his relations with injurious and beneficial species, as he would know beforehand just what species were to be looked for in his immediate vicinity. Furthermore, in the case of noxious animals or weeds which from time to time suddenly extend

* By artificial range is meant the range resulting from the voluntary acts of man.

their range, it would be possible, if the faunal status of a particular species had been previously ascertained, for farmers living within the particular area or province likely to be invaded to prepare in advance for its coming, or to avoid its inroads altogether by planting crops not affected by it. On the other hand, farmers living outside of the region over which this species would be likely to pass might greatly increase their revenues by giving special attention to the cultivation of the particular crops affected by it. In short, a knowledge of the faunal areas and provinces of the United States, coupled with the results of intelligent experimentation on the part of the various agricultural stations, would enable our farmers to select the crops best adapted to their localities, and would put an end to the present indiscriminate experimentation by which hundreds of thousands if not millions of dollars are needlessly expended each year. Agriculture and biology must be studied from the geographic stand-point before we can hope to avail ourselves of the means within our grasp for the rapid advancement of these sciences. But geography is only a part of the broader science of physiography. Physiography deals with the earth's exterior in relation to the atmosphere; it attempts to correlate the forms of the land—the mountain ranges, table lands, plains, valleys, and water-courses—its geologic structure, soil, elevation above sea level, and slope exposure in relation to sunlight, with the phenomena of climate, including temperature and moisture in their various aspects.

Our aim should be to explain the distribution of animals and plants by means of a knowledge of the conditions which govern this distribution, and to formulate the laws which are operative in bringing about the results we see. In other words, we are to study cause and effect in the relations of physiography to biology. A comparatively meager supply of information is sufficient to indicate in a general way the faunal subdivisions of a region, but for mapping the exact boundaries of such areas a vastly greater and more precise fund of knowledge is necessary. The way in which such maps are prepared is by collecting all available authentic records of localities where the particular species has been found. This is done by compilation of published records, by examination of labels of museum specimens, and by work in the field, the latter being by far the most important. The facts thus brought together are arranged alphabetically, and are tabulated under the head of "Species." The localities are then indicated by colored spots on an outline map, the space surrounded by the spots being washed in with a paler tint of the same color. A separate map is devoted to each species. Faunal maps are made by combining a large number of species maps. In making such combinations it is found as a rule that a considerable percentage of the species maps fall into certain well-defined categories whose color patches are essentially coincident. The composite resulting from the co-ordination of these maps may be held to represent the natural faunal areas of a country. Several such areas may be characterized by the common possession of species not found elsewhere, and may be combined to constitute a faunal province; several provinces a region, and several regions a realm or primary zoo-geographical division of the earth's surface. Having ascertained the actual extent and limitations of the faunal districts, it remains to correlate the facts of distribution with the facts of physiography. Foremost among the influences known to affect the distribution of terrestrial forms of life are the protean elements and manifestations commonly termed climate. To stop at

the word "climate" is a profession of ignorance. We must look to the separate elements that go to make up climate, and must study the physical features which determine the so-called climatic conditions prevalent in any region. Among the most potent of atmospheric influences are temperature, humidity, and wind, each of which must be considered both singly and in combination with one or both of the others.

Finally, the interrelation of plants and animals must not be lost sight of. Here we have to do with the influences of vegetation—of forests, thickets of undergrowth, plains of sage-brush, prairies of waving grass, and the multitude of other forms which plants assume in their efforts to hide the bare surface of the earth—upon the distribution of animal life. Conversely, the effects of animal life in checking or limiting the growth and dispersion of plant life remain to be considered. And this takes us back to the original economic work of the Division.

The great importance of a knowledge of the geographic distribution of species, particularly in view of the large sums recently appropriated for the establishment of agricultural experiment stations in various parts of the country, has led the Division to undertake the preparation of a number of colored maps showing what is now known of the distribution of particular species of mammals and birds. Only a beginning has been made, and further progress must be slow for want of adequate means to carry on the work. Competent field agents must be sent to many parts of the country to collect information before the work can be completed. It is hoped that the means of doing this will be granted the Division.

SPECIAL REPORTS.

The following special reports will be found herein :

- (1) Introduced Pheasants. By Dr. C. Hart Merriam, Ornithologist.
- (2) The Mink (*Lutreola vison*). By Dr. C. Hart Merriam, Ornithologist.
- (3) The Sparrow Hawk. By Dr. A. K. Fisher, Assistant Ornithologist.
- (4) The Short-eared Owl. By Dr. A. K. Fisher, Assistant Ornithologist.
- (5) The Food of Crows. By W. B. Barrows, Assistant Ornithologist.
- (6) The Rose-breasted Grosbeak, an Enemy of the Potato Bug.

INTRODUCED PHEASANTS.

PACIFIC COAST REGION.

Four flourishing colonies of introduced Pheasants now exist in the Pacific Coast region. The most northerly of these is on the south end of Vancouver Island, near Victoria ; the second on Protection Island, in Puget Sound ; the third at the junction of the Willamette River with the Columbia ; and the fourth in the middle portion of the Willamette Valley. The two latter colonies are now separated by so narrow a strip of territory that they will doubtless become united during the next few years. The above facts were ascertained by personal observation in the early autumn of 1888. All of the Pheas-

ants comprising the three colonies last mentioned appear to have been imported from China by Judge O. N. Denny. Concerning the exact dates of the several importations, and the number and kinds of birds imported, it is difficult to obtain positive information, as may be seen from the somewhat conflicting testimony appended to this article. The species positively ascertained to be present in the Oregon colonies are the following: The Golden Pheasant (*Chrysolophus pictus*), Green Pheasant (*Phasianus versicolor*), and Ring Pheasant (*Phasianus torquatus*), of which the latter is by far the most abundant. I am not aware that the so-called English Pheasant (*Phasianus colchicus*) is found in Oregon, though it is the species most frequently introduced in the Eastern United States.

On Protection Island, near Port Townsend, in Puget Sound, there are at present three species of imported Pheasants, namely: The Golden, the Mongolian or Ring-necked, and the Silver. They were sent there by Judge O. N. Denny, from China, along with two other species which soon disappeared and have not been since heard from. One of the latter seems to have been a species of Partridge. I was told that these birds were sent to Protection Island for the purpose of breeding and multiplying in order that they might be exported to stock various parts of the Pacific coast region, particularly in Oregon and California. The owner of the island, a Mr. Powers, was paid at first to take care of the Pheasants, to feed them when necessary, and to keep off shooters. After the first year or two, however, the pay was discontinued and the Pheasants became the property of the owner of the island. I am informed that the island has been sold recently, together with the Pheasants, to some one in California. The Golden Pheasants and Ring-necks have multiplied and are now abundant, but the Silver Pheasants have decreased, and not more than about a dozen are left. They are shy and keep in the woods. The Golden Pheasants are tame, and will even eat from the hand. The Ring-necks are said to be the most numerous of all, and to be as wild as the native Grouse. About half the island is cleared and has grown up to grass, the remaining portion being covered with dense evergreen forests and undergrowth. I am told that the Crows, doubtless *Corvus caurinus*, have learned the nesting habits of the Pheasants and are likely to prove a check to their increase, as they devour the eggs.

Mr. A. H. Morgan, of Portland, Oregon, has given me the following information concerning the importation of Pheasants into Oregon: All the birds imported were sent from China by Judge O. N. Denny, then consul-general to Shanghai, at a total cost of about \$300. They were shipped to Mr. Morgan, my informant, who personally looked after and liberated them.

PHEASANTS.—The first importation (1881?) consisted of Mongolian Ring-necks, with the exception of three Sand Grouse or Partridges, which latter were never heard from after their liberation. This batch was shipped on a vessel which went to Puget Sound. The Pheasants were put into chicken crates and sent from Puget Sound to Portland, where Mr. Morgan received them. Most of them died on the way, but twelve males and three females reaching Portland alive. These were taken at once to the farm of George Green, at the mouth of the Willamette River, about 12 miles from Portland, where they were set at liberty. Though wild they returned to the barn-yard to feed with the chickens. This was in spring. During the summer two of the three hens were observed with

broods, and it was thought that the third hen was successful also in rearing young. At all events they began to spread in the fall of the same year, and were found on Sophia Island as well as at several places on the main-land before winter. They wintered well, and have been increasing ever since. They are now common. Soon after their importation the legislature passed a special act for their protection.

The second importation (1882?) consisted wholly of Mongolian Ring-necks. Thirty-five or thirty-six birds, about half of each sex, were sent direct from China to Portland, where they arrived in fair condition. They were taken to Washington Butte, about 12 miles east of Albany, in the Willamette Valley, and there liberated. Within two months a pair was observed on a farm 50 miles from the place where they were set at liberty. They crossed the river into Polk County the same year, and are now abundant in Polk, Marion, and Linn Counties. The two original colonies have never met, there being an area across the Lower Willamette where Pheasants have not yet appeared. Some complaints of their depredations in grain fields have been made by farmers.

SAND GROUSE.—In or about 1881 nine Sand Grouse were liberated on the Clatsop Plains. They promptly disappeared and have not been heard from since.

The *American Field* for January, 1885 (p. 57), contains the following notice:

Arrival of Chinese Game Birds.—Judge O. N. Denny, who arrived here from China by the last steamer, says the *Portland Oregonian*, brought with him thirty baskets and seven crates of Chinese game birds. They comprise specimens of six varieties of the pheasant family, and arrived in splendid order, only four of about ninety birds shipped having died; * * * of the number thirty-one are Golden Pheasants. * * * The remainder are Silver, Copper, Green, Trogapan, and Ring-necked Pheasants, there being only a few of the latter, of which Judge Denny made several shipments while in China, which are now doing well and increasing rapidly in various sections of the State.

Mr. Asher Tyler, of Forest Grove, Oregon, has kindly written the following in reply to my inquiries on the subject:

From the time the Pheasants mentioned in your letter were imported by Judge O. N. Denny I have watched them closely and have learned their habits thoroughly.

(1) The *Ring-necks* were let loose in 1882. Fifteen females and ten males were placed on Judge Denny's farm, 95 miles south of Forest Grove. Two years ago two or three were seen in our neighborhood. Now (January 21, 1889) there are about two hundred of them in our vicinity, having spread very rapidly and increased wonderfully. The females produce from fifteen to eighteen eggs of good size at each litter, and hatch them all. Some of them lay two litters a year or season, and raise all their young. The old ones have lots of nerve; will fight a hawk, or anything that comes near them. The cocks will go in a barn-yard and whip the best barn-yard fowls we have, and run things according to their own notion. They are very hardy and stand our winters well. Their favorite haunts are low grounds near fields of grain, on which they depredate. They are very destructive to gardeners as well. They nest in old straws tacks, stubble fields, or grass patches, beginning in May. Farmers while plowing often find their nests, take the eggs, set them under barn-yard hens, and raise the young easily. They become very domestic. I do not hear of their crossing. I have one that is a favorite with all who know him. His plumage is beautiful, having twenty-nine shades and colors blending over the body. The weight of the males is about 5 pounds; of the females, 4 pounds.

(2) The *Golden Pheasants* presented by Judge Denny to the Rod and Gun Club, of Portland, Oregon, two or three years later, were placed on Protection Island, Puget Sound, and have become numerous. A pair was set at liberty on the Clatsop Plains, near Astoria, where they have increased rapidly. Occasionally one is seen in our vicinity, about 90 miles from where they were turned loose four years ago. Yesterday I saw two pairs of Golden Pheasants a short distance from town. Their

habits are about the same as those of the Ring-necks. They are hardy, easily domesticated, but not as prolific as the Ring-neck. Their flesh is white and tender.

(3) *The Tragopan Pheasant*.—Only two females came through alive. They were turned loose on Protection Island with the Golden. I have not been able to get any account of what became of them after being turned out.

The above birds are all protected by State laws for two years longer, but in several of the counties they have become so numerous that farmers kill them as a nuisance. Report says that whole fields of wheat have been destroyed by them, and that gardens are torn up—not even onions being exempt from their appetities. Great complaints are made against them. The legislature of our State has been petitioned to repeal the law protecting them. (Letter dated January, 1889.)

Dr. F. S. Matteson writes from Aumsville, Marion County, Oregon, under date of January 22, 1889:

The bird in question was sent here from China by Hon. O. N. Denny, American minister to that country, some seven years ago. There were two importations, one of which I did not see, but I think there were fifteen or twenty hens, with a less number of males. Now they are plentiful in most parts of the Willamette Valley, but I am not informed that they have as yet passed outside of it. They are more a bird of open ground than the native Pheasant. They seek brush and timber for shelter when flushed, but will not "tree" for a dog. They usually make a loud cackling noise when flushed. They lie close, and run and hide with remarkable dexterity, and are a hard bird to get. This Pheasant is well adapted to take care of himself, is increasing fast, and has evidently come to stay. He is voted a nuisance by the farmer, and I am afraid his introduction will prove a calamity to the country, whatever it may be to the sportsman. He is a vigorous fighter, and there are many reports of his going through the farmers' roosters. Cases are reported of his crossing with the hens. He is destructive in gardens, and in patches of berries and small fruits. I am of opinion that he robs the nests of other birds. The Quail have nearly disappeared in this locality since his advent, and I think he is to blame. He is pretty good eating, about like our native Pheasant, but I am inclined to regard him as a gaudily painted deception and a fraud. But we have got him, and our State law for his protection has yet four years to run. Happily, however, it is fast becoming "more honored in the breach than in the observance." That he will overrun the United States, at least all but the heavily timbered portions of it, I have no doubt. All the plains country and untimbered hills and mountains between this coast and the Atlantic are adapted to him, especially the more southern parts, and I see nothing to prevent him from spreading himself. The State that protects him will make a grave error, for he is of no use except as a "game bird," and will crowd out many other useful kinds. He "roosts" on the ground, hiding in grass or weeds. The hen lays, on the ground, from twelve to eighteen eggs at a clutch, and raises two and sometimes three broods in a season. The male "crows" something like a young domestic rooster just learning the art, and flaps or rather flutters his wings *afterward*. He will sit on a fence and crow for hours, in plain view, when you have no gun, but if you think you can get him when you have your gun, try it and see!

Mr. R. S. Barr, also of Aumsville, Oregon, writes as follows:

In the spring the male goes alone. Mornings they crow like our common cock of the barn-yard. They hatch about the 1st of May. They are very destructive birds both to grain and small fruits. The Pheasant is naturally a tame bird. When not disturbed he often comes in the chicken yard and fights the chickens. It is generally believed that he destroys the eggs and young of useful native birds, but we have no proof of this. There is a law to protect him here, but it is generally disregarded by the people. (Letter dated January 24, 1889.)

Mr. George S. Johns writes that at Kalama, Wash., they are abundant and on the increase. It is evident that the birds found there came from the colony at the mouth of the Willamette River, only about 30 miles distant.

Mr. L. Belding, of Stockton, Cal., contributes the following:

Some years ago a flock of English Pheasants was put out in the woods of Santa Cruz County, Cal., but nothing has been seen or heard of them since. Colonel Raymond, of San Mateo, has a number of these birds, English and Japanese, but he has had no success in raising them; when let out they suddenly disappear and nothing is seen or heard of them. Mr. Howard, near by, has experimented with the same bird.

A few weeks since he informed me that his foreman told him he had seen a flock of twenty-two. The birds mentioned are the only ones experimented with. Certainly thus far the experiments in California are not a success. In Oregon they have met with great success.

The *Portland Oregonian* of January 30, 1889, contains the following letter from Hon. T. T. Geer in relation to the Pheasant legislation:

THE MONGOLIAN PHEASANTS.

SALEM, OREGON, *January 29.*

To the Editor of the Oregonian:

The *Oregonian* seems to misunderstand the main feature of the Mongolian Pheasant bill now before the legislature.

While the bill as introduced by myself does repeal the original act of protection, the game laws of the State are amended so as to afford the same protection to Mongolian Pheasants as to all other birds of similar nature.

Those of our people who are unused to these birds would upon further acquaintance view this bill in a different light. In the matter of "multiplying" they seem to regard themselves as having been specially included in the original biblical injunction, and are striving, in season and out, for first money. * * * You had just as well provide for the prevention of the extermination of grasshoppers; as a farmer, however, I not only have no objection to them but rather admire them, and would not for a moment favor a measure that would tend to act even as a check to their propagation.

In the *Sunday Oregonian* you admit that "in some places they do damage to grain fields," but excuse them for the reason that the damage "doesn't amount to much in the aggregate," and the inference is that they must be unmolested until their damage does amount to "much in the aggregate," and then the protection may be withdrawn safely.

It is a curious argument that confesses a thing to be a "nuisance" now by admitting that it injures a few of our farmers, but still insists that protection must be extended to it until it becomes strong enough to reach all our farmers and then turn loose.

I am a friend to the Mongolian Pheasants, and willingly favor giving them the same protection afforded our other birds, but where they are numerous enough to destroy grain fields it certainly ought to be lawful to kill them, and in those sections of the State where there are none it is not at all likely many will be killed. "I shall vote for the bill."

T. T. GEER.

THE MINK (*Lutreola vison*).

The Mink inhabits the whole of the United States, excepting the arid regions, which are unfitted for its habits of life. It is a species of great economic importance, both on account of the value of its fur and on account of its injurious habits. As an enemy to the poultry yard it ranks ahead of the Weasel and all other North American mammals. Furthermore, it kills large numbers of fish, as it not only swims and dives with facility, but can remain long under water, pursuing and capturing its prey by following it below the surface. Oftentimes its destructiveness in this respect renders it a serious obstacle to the industry of fish culture. Away from the vicinity of man it habitually feeds upon small mammals, birds and their eggs, fish, frogs, turtles' eggs, and the like. In the nest of a Mink I once found the remains of a muskrat, a red squirrel, and a downy woodpecker. Its harmfulness is offset in a measure by the good it does in killing injurious rodents, particularly muskrats and common rats and mice. Hence, although an acknowledged enemy to the poultry raiser and fish culturist, it is a public benefactor in localities where muskrats damage dikes, canals, irrigating ditches,

THE MINK (*LUTREOLA VISON*).



and ponds. At the same time, in the light of our present knowledge, it must be regarded as more injurious than beneficial, at least so far as the farmer is concerned. From the farmers' stand-point it is interesting principally as an enemy to barn-yard fowls. Though amphibious, and commonly inhabiting the borders of ponds and streams, it makes long excursions, and is frequently found in places remote from water-courses. It often takes up its abode in or near the poultry-yard or duck-pond, remaining there for weeks. Its small size and nocturnal habits help to conceal its movements, and the daily loss of a fowl is commonly attributed to the skunk, fox, weasel, or owl.

The Mink is remarkably strong for so small an animal, and has been known to drag a Mallard Duck more than a mile in order to get to its hole, where it was joined by its mate.

In times past, when the fur of the Mink commanded a higher price than at present, Mink farming has been carried on successfully as a profitable industry. The females begin to breed when one year old; the period of gestation is six weeks, and from three to ten young are born at a time. In the latitude of New York there is but one litter a year, and this is brought forth in the early part of May.

The best way to capture a Mink is by means of a steel trap, properly concealed and baited with a bird or fish. Professional trappers find the Mink attracted by the smell of an oil made from fish that have been allowed to decay in a loosely corked bottle placed in the sun. The odor from this oil is said to be effective at considerable distances, and a few drops of it will often entice a Mink into the trap when no bait is visible.

The following examples of testimony from farmers and others indicate the extent of its depredations:

Dr. William C. Avery, of Greensborough, Ala., writes that in the spring of 1887 the poultry house of his sister was visited two or three times a week by a Mink until at least a dozen hens were killed.

David H. Henman, of Willows, Dak., writes that in December, 1886, a Mink killed all of his hens in one night. He says:

The third night he killed the cock, and I found him in the hen-house the next morning taking his breakfast. One of my neighbors lost fifty-one fowls in one night by one Mink, which was found in the morning finishing his meal; he was killed with a stick; only two chickens were left alive.

William H. Ferrit, of Bristol, Ill., says:

The Mink is the worst enemy to poultry that we have. He follows up small streams and destroys thousands of eggs and poultry.

W. H. Head, of Bristow, Iowa, says:

In January, 1887, a Mink visited the poultry house of my brother, and in one night killed eighteen full-grown fowls. The hen-house is about 40 rods from a large marsh where Minks are plentiful. During the past winter my brother lost more than one hundred fowls from these pests. We once set a large Cochin hen in the banking of an old straw stable. This was some time in June. Early one morning I observed a large Mink near the stable. A few days later I examined the nest. There was but one egg left. The next morning I went to the stable and found the hen missing. Reaching back into a hole behind the nest, and feeling the hen, I pulled her out. She was dead, with a hole in her neck which the Mink had made to suck her blood. The next day my brother shot the Mink. We then took away the banking of the stable and found most of the eggs unbroken, and also found five young Minks.

John B. Lewis, of Eubank, Ky., writes:

In the summer of 1884 I lost seven chickens in one night by a Mink. The night following I caught the Mink on its return to the hen-house. Again on the night of

November 16, 1887, a Mink entered our hen-house and killed one hen. The following night I killed it on its return.

William G. Voorheis, of South Frankfort, Mich., writes:

One Mink killed thirty-nine hens in three nights. I caught the animal.

G. C. Dinsmoor, of Austin, Minn., writes:

I had five ducks and two hens killed by a Mink; caught him in the act.

N. W. Wright, of Farmland, Ind., writes:

I have known a Mink to kill as many as twenty-four grown chickens in one night in this neighborhood. It was caught in a trap on its return the next night.

H. J. Giddings, of Sabula, Iowa, writes:

In September, 1886, a Mink got into my poultry house and killed ten ducks and twelve chickens, killing from two to eight in a night. I caught him, after which no more were taken.

W. B. Hall, of Wakeman, Ohio, writes:

The past season Minks have been very troublesome on my farm, killing many chickens, often several in a night. They killed fifteen chickens that would have weighed 3 pounds or more. In another week ten more were killed. Since then we have lost two or three more at a time, until in all about forty-five were killed. I have tried various means of trapping, and have finally succeeded in getting rid of most of the Minks.

Mr. George S. Johns, of Dilley, Oregon, writes:

I have known one Mink to kill thirty-one grown chickens in one night, and another Mink to kill sixteen half-grown turkeys in one night. I caught the Mink on both occasions.

A. J. Johnson, of Hydeville, Vt., writes:

This season a friend lost nearly all of his chickens and ducks by Minks. His poultry house was near the river, and the animals were seen by him.

Marcus S. Crane, of Caldwell, N. J., writes:

A Mink dug a hole under the door of our duck pen one night and killed three ducks. I put a steel-trap in the hole next night and captured the Mink.

Hon. Robert B. Roosevelt, of Sayville, Long Island, N. Y., writes:

In the course of a week I lost seven spring chickens and caught the Mink which killed them. We have suffered in a similar way from Minks before.

J. W. Van Kirk, of Milton, Pa., writes:

On one occasion I lost eight ducks by a Mink: each one was bitten in the neck.

J. W. Johnson, of Meriwether, S. C., writes:

When Minks are numerous they are very destructive, sometimes killing as many as a dozen chickens in one night.

J. H. Shank, of Hickory, W. Va., writes:

Minks are very destructive to chickens, killing sometimes as many as a dozen in one night.

Z. L. Welman, of Stoughton, Wis., writes:

A neighbor lost a flock of ducks by a Mink, which he killed. Another neighbor lost a dozen hens by a Mink; he killed it also.



THE SPARROW HAWK (*Falco sparverius*).

By Dr. A. K. FISHER.

The Sparrow Hawk is probably the best known as well as the smallest and one of the handsomest of American hawks.

It ranges over the entire continent of temperate North America, breeding in suitable localities from Maine to California, and from the far countries south into Mexico. Its nest has been taken as far north as Fort Resolution (lat. 62°), on Great Slave Lake, which probably is near the most northern limit of its distribution. It is reported as rare in most parts of New England, though there are certain sections where it is fairly common. In the mountains of the West and in most parts of the South it is abundant, and at certain times of the year is common on the Great Plains. In winter a few hardy individuals remain in southern New England and New York, but the species as a winter resident is not common until the latitude of Maryland and Virginia is reached; thence southward it becomes more and more plentiful. In the Mississippi Valley it does not range quite so far north in winter as along the Atlantic, for few are found above the 38th parallel. Along the Pacific coast it winters considerably further north than at the East.

This little Hawk guards the vicinity of its home or hunting ground

with zealous care, resenting the invasions of the larger species. The writer has often seen a Red-tailed or Red-shouldered Hawk enter a locality in which a Sparrow Hawk was perched on the top of some tall tree, evidently thinking he had a prior right to the whole region. As soon as the large hawk approached near enough, the Sparrow Hawk launched out in pursuit, and in a very short time the intruder was convinced that hunting could be carried on to better advantage in other places. In making an attack the Sparrow Hawk always rises above its enemy and darts down, striking with bill and talons.

In a locality where it is very little molested it is quite tame and unsuspecting, often allowing a person to approach as near as 20 yards before taking wing, and when flushed it flies but a short distance. It is quite another matter to advance upon one in places where it is more or less hunted. Experience seems to have taught it just how far a gun will carry, and generally it will leave the perch just before an effective point is reached. After following it for an hour or more and taking a few chance shots, the gunner usually gives up in disgust and leaves the hawk in as good spirits as when first seen.

The Sparrow Hawk builds its nest in hollows of trees, either in natural excavations which are formed by erosion of the dead wood by the elements, or in holes made by the larger woodpeckers. If the flicker (*Colaptes*) is the bird imposed upon, which is most often the case, it never openly battles with the hawk for the retention of its home, but sometimes annoys the latter by removing the nesting material as fast as it is deposited, making it finally necessary for one of the hawks to remain near to guard the nest.

The cavity chosen is usually a considerable distance from the ground, rarely under 20 feet and often in the tops of the highest trees. In the West, on account of its mode of nesting, the species is more or less restricted in the breeding season to the near vicinity of timber, though in some localities it nests in cavities in limestone cliffs or in holes made by kingfishers in the sand banks. It has been stated that occasionally the deserted nests of crows or other birds are made use of, but this habit must be extremely rare. Capt. Charles E. Bendire, whose field experience in the West has been extensive and varied, and often in places where birds by force of circumstances are not able to follow a fixed habit, informed the writer that on one occasion only did he suspect this hawk of breeding in an open nest. In the case in point the evidence was anything but satisfactory, for although the birds were seen near the nest, which was situated in a very large tree, he thought there might have been a cavity which was not visible from the ground. In California Prof. B. W. Evermann has found it using the deserted nest of the magpie (Auk, vol. iii, p. 93). This is not so strange, for we might expect the entrance in the side of the canopied nest of the magpie, simulating an opening in the side of a tree, would attract the hawk, especially in a locality where desirable hollows are scarce.

Dr. William Wood mentions the following interesting instance of departure from its usual nesting habit:

A farmer made a dove-house inside of his barn with holes through the sides of the building communicating with it. A pair of doves that had nested there were attacked and killed by a pair of Sparrow Hawks, who took possession of their nest, laid four eggs, and commenced to sit. (*American Naturalist*, Vol. VIII, No. 5, p. 268, May, 1874.)

In Florida it commences to breed early in March; in the latitude of New York about the middle of May, and in the northern part of

its range it is probably June before the eggs are deposited. The number of eggs in one nest is usually five, rarely more.

Its ordinary flight is irregular and not long continued. Even in migration it often stops to rest on a tree top or fence post, where it may remain a considerable time. Still it is capable of very rapid flight. It rarely if ever soars as do most of the other hawks. Sometimes it makes a succession of rapid beats of its wings and sails for a short distance, but usually, when in search of food, instead of circling, it hovers, remaining stationary with rapid-moving wings. If it perceive its quarry it drops to the ground to seize it, and, if successful, bears it away to a neighboring stub or fence pole to devour.

Food.—The subject of the food of this hawk is one of great interest, and considered in its economic bearings is one that should be carefully studied. The Sparrow Hawk is almost exclusively insectivorous except when insect food is difficult to obtain. In localities where grasshoppers and crickets are abundant these hawks congregate, often in moderate-sized flocks, and gorge themselves continuously. Rarely do they touch any other form of food until, either by the advancing season or other natural causes, the grasshopper crop is so lessened that their hunger can not be appeased without undue exertion. Then other kinds of insects and other forms of life contribute to their fare; and beetles, spiders, mice, shrews, small snakes, lizards, or even birds may be required to bring up the balance. In some places in the West and South telegraph lines pass for miles through treeless plains and savannahs. For lack of better the Sparrow Hawks often use these poles for resting places, from which they make short trips to pick up a grasshopper or mouse which they carry back to their perch. At times, when grasshoppers are abundant, such a line of poles is pretty well occupied by these hawks.

A dozen or more stomachs collected by Mr. Charles W. Richmond, in Gallatin County, Mont., during the latter part of August and early part of September, 1888, were kindly turned over to this Division for examination. They contained little else than grasshoppers and crickets.

Mr. W. B. Hall, of Wakeman, Ohio, writes to us on the subject as follows:

The Sparrow Hawk is a most persistent enemy of the grasshopper tribe. While the so-called Hawk law was in force in Ohio, I was township clerk in my native village and issued certificates to the number of eighty-six, forty-six being for the Sparrow Hawk. I examined the stomachs and found forty-five of them to contain the remains of grasshoppers and the elytra of beetles, while the remaining one contained the fur and bones of a meadow mouse (*Arvicola riparius*).

The following from the pen of Mr. H. W. Henshaw substantiates what we have said in regard to their fondness for grasshoppers:

It finds * * * an abundant supply of game in the shape of small insectivorous birds; but more especially does its food consist of the various kinds of coleopterous insects and grasshoppers, of which it destroys multitudes. In fact, this last item is the most important one of all, and where these insects are abundant I have never seen them have recourse to any other kind of food. (Zool. Expl. West of 100th Merid., Vol. v, 1875, p. 414.)

The late Townend Glover, formerly Entomologist of the United States Department of Agriculture, states that the beneficial traits of this hawk more than counterbalance any harm it may do, and says:

In proof of this, a Sparrow Hawk, shot in October, among a flock of reed or rice birds, was found to be filled with grasshoppers, and contained not the slightest vestige of feathers or bones of birds. This bird was remarkably fat. (U. S. Agric. Report, 1865, p. 37.)

Mr. C. J. Maynard, writing on the food of the Sparrow Hawk at Miami, Fla., says:

They have nothing to do but to pick up grasshoppers, of which they appear never to tire. It is true that they can find green grasshoppers and brown grasshoppers, grasshoppers with wings and wingless grasshoppers, but still, as far as any distinctive taste is concerned, there must be but little variation. Yet to all appearances the hawks are satisfied, for I never saw one take any other kind of food. (Birds of Eastern North America, 1881, p.297.)

In the vicinity of Washington, D. C., remarkable as it may appear to those who have not interested themselves specially in the matter, it is the exception not to find grasshoppers or crickets in the stomachs of Sparrow Hawks, even when killed during the months of January and February, unless the ground is covered with snow.

It is wonderful how the birds can discover the half-concealed, semi-dormant insects, which in color so closely resemble the ground or dry grass. Whether they are attracted by a slight movement, or distinguish the form of their prey as it sits motionless, is difficult to prove, but in any case the acuteness of their vision is of a character which we are unable to appreciate.

Feeding on insects so exclusively as they do, it is to be presumed that they destroy a considerable number of beneficial kinds, as well as spiders, which they find in the same localities as the grasshoppers. However, examination of their stomach contents shows the number to be so small, compared with that of the noxious species, that it is hardly worth considering.

After the severe frosts of autumn and in winter, when insect life is at its lowest ebb, the Sparrow Hawks devote more time to the capture of mice and small birds. As a rule, the birds which they capture at this time are ground-dwelling species, which simulate the movements of mice by running in or about the dry grass and weeds. They are mostly sparrows, more or less seed-eating, and hence not among the species most beneficial to the agriculturist. At this season it is common to see Sparrow Hawks sitting on the poles over hay stacks, or stationed where they can command a good view of the surroundings of a hay mow or grain crib, ready at any moment to drop upon the mouse which is unfortunate enough to show itself. In this way they manage to destroy a vast number of mice during the colder months.

In the spring, when new ground or meadow is being broken by the plow, they often become very tame if not molested. They fly down, even alighting under the very horses for an instant in their endeavor to capture an unearthed mouse or insect.

The following letter from W. P. McGlothlin, of Dayton, Columbia County, Wash., dated February 12, 1887, contains some interesting facts on this particular subject:

There is a small hawk here called the Sparrow Hawk. It comes about the 1st of March and leaves with its young about August 1st. On their arrival they are in large flocks and seem very hungry. I have had a number follow my team all day long and even alight for a moment on the plow beam. When a mouse was unearthed it was captured in an instant and quickly killed. The hawks seem to know just when their victims are dead. They settle on something suitable to their fancy and commence eating the eyes, and then soon finish. For two weeks this mouse catching goes on. I have sometimes seen them chase and catch small birds. They pair off and drive some woodpecker from his cozy nest in an old tree, where they lay from four to six eggs. When they have young the small chickens must suffer. About two each day for every nest seems to satisfy them.

Mr. Thomas McIlwraith, in his "Birds of Ontario," gives the following on the food of this hawk:

Though sometimes seen near the farm-house it does not bear the stigma of having felonious intentions towards the occupants of the poultry yard, but is credited with the destruction of large numbers of mice. * * * It also feeds freely on snakes, lizards, grasshoppers, etc., but has the true falcon etiquette of taking only what is newly killed (p. 150).

In the opinion of many people, unaccountable as it may appear, the benefit accruing from the destruction of a great number of mice or other injurious mammals or insects by hawks does not offset the damage done by the capture of one bird or chicken. This, of course, is not the case with those intelligent farmers who recognize the benefit done by this little hawk, and are not prejudiced against it if it exacts a moderate interest now and then in the shape of a young chicken or bird. In May and June, when the hawks are busy hatching their eggs and rearing their young, there is less time for them to procure their favorite food. It is during this period, as we might expect, that a very large proportion of the birds which they capture in the course of the year is taken. It is also at this time that we hear complaints of their depredations in the poultry yard. Sometimes they take young birds from the nest, for Mr. Austin F. Park, of Troy, N. Y., mentions the finding of unfledged birds among their stomach contents. From the following note it may be seen that occasionally they take also old birds from the nests:

In Elizabeth, N. J., several years ago. I saw a pair of Sparrow Hawks fly up under the eaves of an old barn and drag a couple of swallows out of their nests. (Merriam, *Review of the Birds of Conn.*, 1877, p. 85.)

That the Sparrow Hawk at times attacks and kills comparatively large birds is vouched for by Dr. Coues, in his *Birds of the Northwest*. He says:

I have seen it overpower and bear away a thrasher, a bird inch for inch as long as itself, and nearly as heavy.

And we have found remains of the meadow lark in the stomachs examined.

In the accompanying table a summary is given of the food of the Sparrow Hawk, arranged according to months. It is based upon data derived mainly from the examination of stomachs made by myself in the Department of Agriculture.

It is to be regretted that during certain months, notably May and June, we were unable to obtain more specimens for examination. The available number is so small that the result here given probably would be totally changed by the addition of a dozen specimens to each of these two months.

Of the one hundred and sixty-three stomachs examined, not one contained the remains of poultry. Thirty-one birds were found, of which twenty were various species of sparrows, three were meadow larks, one was a vireo, one a warbler, one a quail,* and five could not be determined as the feathers and other parts were too much broken up to admit of identification.

* This record of finding the remains of a quail in the stomach of a Sparrow Hawk is given second hand, from an examination made in Nebraska. We strongly suspect, unless the quail was a very young bird, that one or the other small hawks was mistaken for the Sparrow Hawk,

Table giving a summary of food of the Sparrow Hawk, arranged according to months.

Months.	No. of specimens examined.	Birds.	Mice or other mammals.	Reptiles and batrachians.	Insects.	Remarks
January	27	7	24		52	
February	12	2	8		29	1 empty.
March	17	3	8	1	41	3 empty.
April	12	1	7	3	75	1 empty.
May	2	1	1		4	
June	3	3			76	
July	18	2	8		177	
August	19		5	2	263	
September	18	1	2	2	271	
October	7		1		31	
November	5		1		12	
December	23	11	14		96	
Total	163	31	79	8	1,125	5 empty.

For convenience, spiders have been enumerated with the insects.

THE SHORT-EARED OWL (*Asio accipitrinus*).

By Dr. A. K. FISHER.

The Short-eared Owl is a bird of extended distribution, ranging over the greater part of both hemispheres. In Africa it has been found as far south as Abyssinia in winter. It has not been recorded from Australia. In a northerly direction it reaches the southern

part of the Arctic regions, whence southward it probably breeds more or less commonly in favorable localities throughout its range.

The nest is a rough affair made of coarse grass and sticks, loosely drawn together and sparsely lined with fine material and feathers from the parent bird. It is placed on the ground, often in a depression made to receive it, under some bush or among high grass. In exceptional cases it has been found in a clump of low bushes, or otherwise slightly elevated. The eggs, from three to five in number, are deposited in April or May, according to the latitude of the nesting ground.

The Short-eared Owl is pre-eminently a bird of the open country, including the coast marshes and islands covered by bushes and high grass. In the United States it is much more common in winter, when it receives large reinforcements from the North. During this season of the year single individuals are usually met with, and less often small colonies, composed of four or five birds. Possibly these are families which have never been separated, having migrated in company from their nesting grounds.

The food of this owl consists largely of mice and other small mammals. A number of species of insects, birds, and reptiles also may be mentioned as occasionally contributing to its fare. Fully 90 per cent. of the stomachs examined in the Department of Agriculture contained nothing except meadow mice. The remains of as many as five mice were found in one stomach, and several contained three or four each. Prof. F. E. L. Beal reports finding nothing but mice in the stomachs of a pair which he killed in Story County, Iowa. They were shot in an artificial grove swarming with small birds.

Mr. Austin F. Park, of Troy, N. Y., in a report on the food of Hawks and Owls, which he kindly sent to this Department, mentions mice and no other kind of food as found in the stomachs of this species.

Of the other mammals which this owl feeds upon may be mentioned shrews, gophers, and sometimes small rabbits. Shrews are not uncommon in the stomach contents. Dr. J. C. Merrill, in mentioning the food of this bird at Fort Klamath, Oregon, says:

In one specimen a pellet ready for regurgitation contained ten nearly perfect skulls of a shrew, a species of which, and field mice, were nearly always found in the stomachs. (*Auk*, Vol. v, April, 1885, p. 146.)

Unfortunately we have been unable to procure stomachs of this owl from the Western plains which are infested with ground squirrels and gophers, hence we do not know to what extent it feeds upon these rodents. It does not feed as extensively on insects as either the Barred or Screech Owls, but there are reports enough on the subject to show that grasshoppers, crickets, and beetles at times form a considerable portion of its food. It is quite exceptional for this owl to feed upon birds. Out of about fifty stomachs examined by us at the Department not over four contained bird remains.

Only once have we found more than one bird in a single stomach. This was in a specimen shot in the vicinity of Washington, D. C., late in November; it contained the remains of two Juncos and one Fox Sparrow.

A notable violation of its usual habit of feeding upon mice may be quoted from Mr. William Brewster as follows:

A small colony of these birds had established itself upon a certain elevated part of the island [Muskeget], spending the day in a tract of densely matted grass.

Scattered about in this retreat were the remains of at least a hundred Terns that they had killed and eaten. Many of these were fresh, while others were in every stage of decomposition, or dried by the sun and wind. In each case the breast had been picked clean, but in no instance was any other portion disturbed. Every day at a certain time these owls sallied forth in search of fresh prey. We used regularly to see them about sunset, sailing in circles over the island or beating along the crests of the sand-hills. They were invariably followed by vast mobs of enraged Terns, which dived angrily down over the spot where the Owl had alighted, or strung out in the wake of his flight like the tail of a comet. The Owl commonly paid little attention to this unbidden following, and apparently never tried to seize his persecutors while on the wing, but on several occasions we saw a sitting bird pounced upon and borne off. Sometimes in the middle of the night a great outcry among the Terns told where a tragedy was being enacted. (Bull Nutt. Ornith. Club, Vol. iv, p. 19).

The following important evidence of the economic value of the Short-eared Owl is from the fourth edition of Yarrell's British Birds (Vol. iv, p. 165):

Undoubtedly field-mice, and especially those of the short-tailed group or voles, are their chief objects of prey, and when these animals increase in an extraordinary and unaccountable way, as they sometimes do, so as to become extremely mischievous, owls, particularly of this species, flock to devour them. Thus there are records of "a sore plague of strange mice" in Kent and Essex in the year 1580 or 1581, and again in the county last mentioned in 1648. In 1754 the same thing is said to have occurred at Hilgay, near Downham Market, in Norfolk, while within the present century the Forest of Dean, in Gloucestershire, and some parts of Scotland have been similarly infested. In all these cases owls are mentioned as thronging to the spot and rendering the greatest service in extirpating the pests. The like has also been observed in Scandinavia during the wonderful irruptions of lemmings and other small rodents to which some districts are liable, and it would appear that the Short-eared Owl is the species which plays a principal part in getting rid of the destructive horde. An additional fact of some interest was noticed by Wolley, namely, that under such circumstances the owls seem to become more prolific than usual.

THE FOOD OF CROWS.

By WALTER B. BARROWS, S. B., *Assistant Ornithologist.*

The economic status of the Common Crow (*Corvus americanus*) has been discussed so often, and yet with such uncertain results, that it was one of the first birds to receive attention when the Division was organized in 1885, being particularly mentioned in the circular issued that year. Several hundred replies to the questions contained in that circular were received during that and the following year, and much additional information was collected by subsequent correspondence. A request for stomachs of the Crow was contained in the circular issued in 1886, and although the responses to this have not been as numerous as could be desired, a number of correspondents have given material assistance, so that it is possible to append to the present paper the results of the dissection of eighty-six stomachs of the Common Crow (*Corvus americanus*) and twelve of the Fish Crow (*Corvus ossifragus*). Thus the material at hand for a study of the food of Crows, though by no means abundant, is nevertheless considerable, and sufficient progress has been made in its investigation to justify the publication of some of the results. One of the main objects of the present paper, however, is to call the attention of farmers and others to the disputed and unsettled questions relating to the Crow and to secure their aid and co-operation in collecting evidence which will hasten a final settlement of these points.

It is unnecessary at the present time to refer to the numerous con-

tributions to our knowledge of the Crow's habits made from time to time during the last century, but it may be broadly stated that but three strong points in its favor have ever been claimed for the Crow even by its warmest friends: These are (1) the habit of destroying injurious insects; (2) the habit of catching mice; and (3) the habit of eating carrion. A few writers, mainly men of very limited experience, have maintained, it is true, that the Crow never does any harm worth mentioning; but the more rational of his defenders admit freely that a large amount of damage is done, but claim that this is more than compensated by the good habits just specified. Of these, the carrion-feeding and mouse-eating habits have been the weaker arguments, and the place of the Crow as a beneficial bird has rested mainly on the ground of its supposed services in the destruction of noxious insects.

On the other hand, the injuries inflicted by the Crow are more varied, those most commonly complained of being:

(1) Destruction of young grain, particularly Indian corn on first coming up.

(2) Destruction of ripe or ripening corn and other grain.

(3) Destruction of ripe or ripening fruits of some kinds.

(4) Destruction of various other vegetable products.

(5) Destruction of the eggs and young of poultry.

(6) Destruction of the eggs and young of wild birds.

Nearly every one in the least familiar with the habits of the Crow will readily admit that the bird is more or less beneficial or injurious in the ways indicated above, but the greatest diversity of opinion exists as to the degree of benefit or injury to be assigned to each category.

The Division has succeeded in bringing together a large amount of *opinion* on these points, and a considerable amount of what may be regarded properly as *evidence*. Moreover, some additional charges against the Crow have been preferred and some further claims of merit are brought forward. Statements of mere opinion carry little weight unless the facts on which these opinions are based are fully known. On the other hand, the careful record of any actual experience with the Crow is entitled to thoughtful consideration, the weight to be given to such evidence being modified only according to the known fitness or unfitness of the observer to appreciate all the elements entering into the case.

As the entire question relates primarily to the *food* of the Crow, it is obvious that the careful examination of a sufficient number of Crow stomachs would be the only certain method of settling all questions; but the number of stomachs required necessarily would be very great, and in order fully to weigh the evidence thus afforded, full notes as to locality, date, time of day, character of place where killed, age of bird, etc., are indispensable.

About one hundred stomachs, accompanied by such data, have been carefully examined thus far, and a summary of the facts revealed will be found on a following page. Unfortunately, however, most of these stomachs were those of adult Crows, and very few of them were taken during the spring and early summer, when the Crow is supposed to be most beneficial.

It has proved more difficult than was expected to secure Crows during the spring and summer months, but a special effort will be made during the season of 1889, and it is hoped that a large number of stomachs may be collected and examined. Those of young Crows

are particularly desired, but those of Crows of any age if taken during spring or summer will be very acceptable. Persons willing to aid the Division in this way will be furnished with instructions and materials on application to the ornithologist, and all costs of transportation will be defrayed by the Department.

In response to questions relating to the food habits of Crows replies have been received from upwards of five hundred persons, and the information afforded by these replies, in combination with the results of dissection, form the basis of the following report.

DISTRIBUTION OF THE CROW.

The Common Crow (*Corvus americanus*) occurs in variable abundance throughout the whole of the United States; most numerous, perhaps, east of the one hundredth meridian, though it is far from uncommon in California. In most of the Rocky Mountain region it is rather scarce.

Although the larger number migrate southward in winter from the northern tier of States, returning again in earliest spring, probably a few spend the entire winter at the north, even in northern Minnesota and Wisconsin. In the lower half of the Mississippi Valley, however, and in the Middle Atlantic and Gulf States millions of Crows remain from November to March; collecting in some localities in immense flocks, repairing regularly to favorite places to pass the night, and scattering over the surrounding country during the day. In the breeding season they are distributed more evenly, and notes on their food habits have been received from all parts of the country.

Along the Atlantic coast, from Long Island to Florida, another species, the Fish Crow (*Corvus ossifragus*) is found associated with the Common Crow, and the two species are so nearly alike in general appearance and habits that at gunshot range even a practiced ornithologist can not always separate them. But the Fish Crow averages decidedly smaller than the Common Crow, has a different voice, and when in hand is otherwise readily distinguished by one accustomed to study birds. Probably a few notes from the Atlantic seaboard may refer to this species instead of to the Common Crow, but this will not affect materially the questions under consideration. In the detailed report of the examination of stomachs the two species are treated separately.

INJURY TO INDIAN CORN, WHEAT, AND OTHER CEREALS.

It seems almost superfluous to say that the Crow at certain times and places is very destructive to crops of sprouting grain, for its corn-pulling habits were well known even in colonial times, and from that day until the present, wherever the bird is at all abundant, a newly planted corn-field without scare-crows has been the exception and not the rule. Doubtless the destruction is greatest during the first week or two after the corn appears above ground, but if all reports are to be credited considerable harm is done by digging up the seed-corn directly after planting, even before the grain has begun to germinate. One observer states that the Crow eats corn "from ten minutes after planting until the blades are three inches high," and more than a score of other observers state definitely that the Crow not only pulls up the young plants, but *digs* up the newly sown seed. Several observers

state that the Crow *scratches* up planted grain, but this probably is a mistake, for such a habit has never come to our notice, and it would seem to be entirely foreign to the nature of the bird. Crows are known to watch the operation of corn-planting, occasionally with evident interest, and many a farmer knows that any grain left uncovered is likely to be eaten at once. In some cases it is even unsafe to allow the corn to be dropped much faster than it can be covered, since the observant Crow plunders the hill before it is made. It is but natural to suppose that so intelligent a bird as the Crow would be able to locate the hills after the planting is done, and to unearth with the bill any grains which have been but lightly covered. This is all the more likely in the case of birds which have been watching the planting and have picked up the scattered grains left entirely uncovered, especially if the farmer has followed the time-honored custom of stamping or "firming" the center of the hill with the head of the hoe.

Among the reports bearing upon this point are the following:

From George H. Berry, North Livermore, Me.:

The Crows dig corn before it breaks the ground, and do great damage pulling the young corn and also digging potatoes.

From G. Douglas Robertson:

While resident in southeastern Nebraska I have heard farmers complain that the Crow picked the kernels of corn out of the ground just after planting, and know that when the corn commenced to come up the ground was bare in many places, but whether this was the fault of the Crows or of the machine that planted it I can not say.

From W. T. Craig, San Francisco, Cal.:

In Santa Cruz County Crows were observed to eat the corn while planting, and they continued to do so until it was three inches high, pulling it up and feeding upon the grain attached to the rootlets. They destroyed four or five acres, and were then driven away.

From C. W. Costellow, Waterborough, Me.:

Crows dig up and eat corn as soon as it is planted, and continue to do so until the growing spears absorb the kernel. Occasionally in the same way they dig up and eat potatoes just planted.

While these and similar reports seem to show that in some cases the Crow actually digs up the seed even before it germinates, many trustworthy witnesses state that they have never known it to unearth well-covered grain until the sprout appeared at the surface. This, however, is merely negative evidence and only tends to show that the former habit is far less general than the latter.

As has been suggested by more than one observer, the Crow is often blamed for the work of the chipmunk, the latter being known to dig up the newly planted kernels very frequently, especially along the edges of fields near woods. But the chipmunk does not extend his raids far from the edges of the field, and, moreover, he is not known to dig up newly planted potatoes, so that the dozen or more reports which charge the Crow with this last offense give additional weight to the testimony relating to the digging up of corn. Any one who has an opportunity to make exact observations on this question will confer a favor by communicating the results to the Department.

The manner in which the Crow attacks corn which is just coming up is but too well known to most farmers, yet perhaps few of them have actually seen it pull the young shoots from the ground, and doubtless there are many who still disbelieve that the object of the

pulling is simply the swollen grain at the root. From several hundred reports of damage to young corn, we select a few to show the way in which the harm is done.

Byron J. Peckham, of Westerly, R. I., wrote in 1885:

Corn seems to suffer most because the Crows get a large amount for little labor. Their *modus operandi* is to wait until the corn has shown itself above the ground and then pull it and devour the kernel at the roots. The injury done consists largely in the trouble of replanting at a time when other work demands the attention of the farmer.

F. K. Steele, of Annapolis, Md., says:

As the young shoots peep out of the ground the Crow may be seen digging them up. From the time of their first appearance above the ground until the kernel has been absorbed by the growing plant it is destroying the crop. This period lasts two or three weeks, according to the quickness of the growth of the grain.

The injury consists of an uneven stand, requiring replanting. This seldom pays for the trouble, since the corn which was not disturbed by the bird has the start and occupies all the soil with its roots; therefore the replanted corn grows slowly and spindling, and makes fodder principally.

J. M. Nipp, of Bolton, Mo., gives the following interesting account of one of his observations:

But few Crows learn to pull up corn, but one that does will pull ten hills per minute. June 27, 1884, I planted three acres of corn on wheat stubble, the wheat having been hauled away. Ten days after planting I saw eight Crows in the field; from appearances they were two parents and six young. One was pulling the corn, one standing idle, and six eating the grain after it was pulled up. I watched them about forty minutes, and then went and counted the fresh pulled stalks where they had been; there were four hundred. One-third of the three acres was taken at that time. I then supplied them with wheat in the bundle, and no more was taken.

The amount of damage to corn during spring and early summer is certainly very great in some sections, and undoubtedly it would be much greater but for the almost universal custom of protecting the fields in one way or another. Of course, it is absurd to say how great the loss *would be* in case all precautions were neglected, and even in the case of actual damage it is impossible to estimate fairly the amount of the loss. Among nearly two hundred and fifty reports of more or less serious injury, less than one-fifth contain any figures from which the actual loss can be inferred even approximately, while hardly a dozen state definitely the acreage planted and the proportion destroyed or damaged.

The following examples of the evidence on this question will give a fair idea of the harm *occasionally* done. It will be noticed that they represent widely separate sections of the country:

Osceola, Ark.—One flock ruined a field of several acres.

Coveauty, Conn.—In one field of three acres about half was destroyed; other fields badly damaged, probably one-third pulled up.

Osceola, Ill.—Destroyed about two acres for me last year (1885) just as it was coming through the ground.

Plymouth, Me.—Has been observed to destroy whole fields of from one to three acres.

Rochdale, Mass.—Crows this year (1885) pulled one-third or more of the corn in my fields in spite of cotton lines stretched quite thickly over the fields.

Nebraska, Ind.—Have known the injury to amount to one-third of the crop.

Burlington, Iowa.—Have known one-third of a five-acre field to require replanting.

Sand Hill, Mich.—Often destroys over half the crop when planted near a patch of woods. Fields sometimes are nearly destroyed.

Bolton, Mo.—One-third of a field of three acres was taken.

Madison, Nebr.—The damage along the woodlands of the Elkhorn is ten per cent. of the planting.

Caldwell, N. J.—Damage often from one-tenth to one-third of the field.

Alfred Centre, N. Y.—Sometimes they make a second planting necessary; in one case a field of three acres was almost entirely pulled up.

Ithaca, N. Y.—In spite of all our efforts they almost destroyed the crop in a large part of one field.

Locust Grove, N. Y.—In 1884 a large field was ruined by Crows in spite of all precautions. It was "strung" at more frequent intervals than usual, a number of dead Crows were displayed at various points, and it was replanted twice, but all to no avail, for almost the entire field was lost.

Penza, Ohio.—Once saw a field on the 4th of July which had been destroyed four times by Crows, and they were still working on it.

Gap, Pa.—Think they sometimes destroy five per cent. of the crop.

Frogmore, S. C.—The damage sometimes amounts to over 50 per cent., but this is only in fields near woodland.

Brandon, Vt.—One-half to three-fourths of an acre was pulled from a three-acre field.

West Pawlet, Vt.—In 1883 and 1884 I knew the Crows to pull the corn so completely in fields of ten or twelve acres that all the ground had to be planted over.

Omro, Wis.—One piece of four acres was about two-thirds destroyed.

The ten following samples may be taken as showing more nearly than the preceding the *average* character of the reports noting damage to young corn:

Smelley, Ala.—Much damage some years, others none at all.

Brookfield Centre, Conn.—A small piece in a secluded spot was almost entirely destroyed.

Vermillion, Dak.—In some fields on the Missouri bottoms Crows often have destroyed two or three successive seedings of corn, but only in fields near timber.

Marietta, Ga.—The damage is sometimes excessive, depending largely on location of field.

Louisville, Ky.—The damage has been greatly exaggerated. Formerly it was sometimes great, but it is many years since Crows have done any harm in my neighborhood by pulling up corn. They find other food in abundance and have forgotten their old habits.

South Frankfort, Mich.—Injurious only in exceptional cases, and to a limited extent.

Minneapolis, Minn.—The extent of the injury is measured only by the opportunity.

Watkins, N. Y.—Farmers complain of their pulling corn in the spring as soon as it appears above ground; and corn is injured in this way sometimes so that it harvests one-eighth to one-fourth less than if it had not been touched. But not one farmer in twenty is injured as much as stated.

Mount Vernon, Ohio.—Have known them to be quite troublesome in pulling corn when it is two or three inches high, * * * but their attacks appear to be only periodical, perhaps many years apart.

Berwick, Pa.—The damage is sufficient sometimes to compel the farmer to replant, yet the amount of injury done is not often of much account. There are exceptional cases when fields planted near their resorts have suffered considerably.

A careful examination of all the available evidence bearing on this question brings out one or two points which are doubtless familiar to many farmers, but may be new to some. Other things being equal, the greatest damage is done where Crows are most abundant; and fields nearest their nests are much more likely to be plundered than those at a distance from woods. Nevertheless, in the latter case, if the fields are also at a distance from the farm-house and are not specially protected, they may suffer more than other fields which, although near the woods, are so situated as to be easily watched from the house. It is of the utmost importance, moreover, that the Crows be prevented from *beginning* to take corn from a field; for after visiting it once they are far more likely to come again, and there is abundant evidence that after a Crow has once formed the habit of corn-pulling it is almost impossible to prevent his gratifying his taste as long as he lives.

Sometimes the shooting of one or more of the thieves on their first visit to a corn-field will effectually prevent further depredations, but this is not always the case. Scarecrows, windmills, glittering tin, twine, and even the swinging bodies of their slain comrades, do not have the desired effect at all times. Other methods have been tried with more or less success, but all the successful plans involve the expenditure of considerable time, and often a little money as well.

The most generally successful plan of which we have any knowledge consists in coating the corn with tar of some kind before planting, in which case Crows are said to let it entirely alone. Mr. J. V. Henry Nott, of Kingston, N. Y., thus speaks of this method:

I have used for years coal-tar on my seed corn to keep the Crow and chipmunk from eating it. I think it better than scarecrows, as it allows the Crow to roam over the field and pick up insects. I soak the seed over night, and after draining off the water thoroughly stir the tar through it by dipping a small stick in the tar, and then vigorously stirring the seed with it until all is a brown color, after which I stir in plaster until the seed looks like sugar-coated pills. The only objection is that a planter can not be used.

Essentially the same method is used for corn and other grain throughout a considerable part of the Eastern and Southern States, and apparently with good success. Wood ashes, or even dry earth, may be used in place of the plaster, the only use of which is to prevent the grains from sticking together or to the hand of the planter. On many of the rice plantations of South Carolina and Louisiana the same method is resorted to to prevent blackbirds or "rice-birds" from eating the newly sown grain or pulling up the young shoots. It is said that the young shoots from grain thus "tarred" have a strong taste and smell of the tar even until they are several inches high and beyond danger of being uprooted by birds. However this may be, the grain itself is certainly unpalatable to Crows, and they seem to be satisfied after a few trials that corn of that kind is not worth pulling.

Mrs. Margaret Musick, of Mount Carmel, Mo., states that "young corn may be effectually protected by feeding the birds boiled corn or soaked corn, sown broadcast, two quarts to ten acres."

Edward Paschall, of Doylestown, Pa., mentions a similar method used at that place. He says:

Samuel Hart, of this place, a farmer, protects his corn-field every spring against Crows by simply scattering some loose grain every day around his entire field of ten acres; every other day will answer, provided the supply is not exhausted. This method has been practiced with entire success for many years, and though Crows are very numerous, no corn is pulled up. The entire cost, as estimated by Mr. Hart, is the time required and a total of half a bushel of corn.

In some places grain soaked in strychnine has been used to kill Crows, but although they doubtless can be exterminated in this way, the method is attended with some danger to other birds, and to domesticated fowls, while it is not altogether certain that the entire extermination of Crows is desirable at the present time. They are known to do some good—how much is not definitely known, but in another part of this report will be found a summary of the evidence on this point.

It may be remarked here that many farmers as well as other observers contend that the Crow when pulling up corn is only searching for cut-worms or other injurious insects, and in support of this assertion it has been claimed repeatedly that the old Crows do not eat the corn so pulled, nor carry it to their young. This question

will be fully treated under the head of Insect Food of the Crow, and it need only be remarked here that, while Crows undoubtedly eat many cut-worms and other insects, there is very little evidence that they pull young corn for any other purpose than to get the kernel at the root.

The depredations of the common Crow do not cease, except temporarily, when the young plants are too well rooted to be pulled with ease. After the ears are formed and the kernels well filled out the Crow again visits the corn-fields, and sometimes does serious damage. At that time the young are as large as their parents, several families are commonly associated in a flock, and such a party is capable of a large amount of mischief in a comparatively short time. About fifty complaints of injury to "green corn," "corn in the milk," "roasting ears," and "ripening corn," have been received, and from these we select a few samples.

From U. G. Gordon, Barry, Ohio:

The Crows ate corn here while it was in the milk last August and September (1886), some farmers hereabouts losing one-fourth of their crop. They came in flocks, thousands at a time.

From S. T. Kimball, Ellington, Conn.:

It is in the fall that the Crow does his mischief by taking corn in the milk and after it is cut. Last year I judge that I could have picked up a bushel of cobs per acre at the time of cutting. The damage was done wholly by Crows.

From Edwin B. Clark, Waxahachie, Tex.:

Crows eat corn while in the "roasting-ear" stage, that is, before it has hardened or matured, say about four months after planting. Their depredations, however, are confined to corn-fields along creeks or branches of streams where they rear their young in trees. The corn hardens so quickly that the Crows' work is of short duration, hence the destruction is not considered alarming.

From George C. Bunsen, West Belleville, Ill.:

It not only picks up the young corn but when the corn is in the milk it is after it again, tearing open the husk and feeding on the kernels freely. It comes into the corn-fields for this purpose in great swarms and does a great deal of mischief.

From N. W. Wright, Farmland, Ind.:

During the last few years the Crows in this section of the country flock together in the fall (about August), and when the corn is soft they tear the husk from the ears and eat the grain, greatly damaging the crop. This fall I have passed fields adjoining woods where nearly every ear was so mangled as to be seriously injured.

From Charles E. Ingalls, East Templeton, Mass.:

The Crow has been known to eat corn when "in the milk." My attention has lately been called to several instances of this kind where the corn-stalks were pulled down, the ears stripped on one side, and the kernels pecked out. This mischief was charged to 'coons until I showed the real culprit.

Crows also eat considerable quantities of ripened corn, but they do not appear to like it as well as when in the milk. Mr. W. B. Hall, of Wakeman, Ohio, states that tame Crows which he has kept at various times "would not eat dry grain, but were very fond of green corn when husked."

From upward of seventy reports of damage to ripened corn a few are selected.

From Hugh N. Starnes, Marietta, Ga.:

In the fall some damage is done to corn in the ear, after ripening and before gathering, but the damage is inconsiderable.

From D. C. Shely, Nicholasville, Ky.:

I have known Crows to destroy one-fourth to one-half of a corn crop when left out in winter and everything else was snowed under. There is no necessity for any such loss if the farmer would secure his crop in reasonable time.

From H. A. Koch, College Hill, Ohio:

Crows frequent the corn-fields in such numbers that their depredations seriously affect the crop, especially when the corn is left standing in shock long.

From H. C. Griswold, Watkins, N. Y.:

At the present time (September 30, 1885), two or three hundred Crows are feeding upon standing corn.

INJURY TO OTHER CEREALS THAN CORN.

Although the Crow attacks and injures other grains than corn its depredations on these crops are far less general and serious. About fifty reports of such injury have been received, the losses complained of relating to wheat, rye, oats, barley, and rice. As with corn, the greatest damage is done by pulling up the sprouting grain, but more or less is eaten while ripening, or even when hard. A few samples of the evidence are appended.

From F. H. Holmes, Rio Vista, Cal.:

The Crow does some damage in the grain sections around Rio Vista to wheat and barley, just after sowing and until it is well sprouted.

From W. E. Dingman, Newton, Iowa:

In some instances it is known to pull up and eat wheat and rye when two or three inches in height. The damage has not been very extensive in either case.

From Asher Tyler, Forest Grove, Oregon:

The Crows congregate here in large flocks, but are only destructive to new-sown wheat.

DAMAGE TO OTHER CROPS.

About a dozen reports, nearly all from New England and Canada, mention the Crow as destructive to potatoes, the worst mischief being done by pulling up the young plants in order to get the partly decayed pieces planted as "seed." Occasionally sweet potatoes and beans are pulled up in the same way, and in some of the Southern States the Crow digs up pea-nuts both as seed and when ripening, sometimes causing considerable loss. The following notes from correspondents illustrate this class of injuries:

From S. F. Cheney, Grand Manan, New Brunswick:

The Crow will take the potato seed out of the hill and pull up the potatoes when nearly ready to hoe.

From Manly Hardy, Brewer, Me.:

I have known newly planted potatoes to be destroyed by the acre. Have only known Crows to attack potatoes within a few years (1885).

From Charles F. Goodhue, Webster, N. H.:

Crows are very troublesome some years by pulling corn and digging up newly planted potatoes, destroying both just as they appear above ground. The damage done to corn and potatoes varies from a few hills to nearly two acres. Sometimes nearly the whole crop is destroyed.

From Walter Hoxie, Frogmore, S. C.:

The Crow destroys seed corn and rice invariably, unless tarred. It is yet more destructive to pea-nuts and sweet potatoes.

From J. W. Johnson, Meriwether, S. C.:

Crows are very destructive to pindars [pea-nuts], scratching them up about the time they mature.

From John M. Richardson, Daingerfield, Tex.:

I have known the Crow, assembling in immense flocks, to do great harm to the pindar [pea-nut] crop in South Carolina. As the nuts approached maturity the fields had to be guarded by men and boys with guns from early dawn to late dusk.

In some parts of the country the Crow seems to have acquired a taste for water-melons, doing no little damage to this important crop. Mr. H. E. VanDeman states that at one time, on his farm at Genoa, Kans., he was obliged to cover some of his water-melons with grass, weeds, etc., in order to protect them from a family of Crows which otherwise would have ruined them all. They began to "plug" the melons as soon as they were nearly ripe, going from one to another until they found one which suited them, spoiling many which they did not eat. Reports of similar damage have been received from Georgia and South Carolina, one planter complaining that his melons are attacked before they are half grown, and another estimating his loss from the same cause at 10 per cent. of the crop.

Occasionally Crows do much damage to ripening fruit, but they generally find an abundant supply of wild fruits, and do not care to run the risk of a near approach to the garden unless the display is particularly tempting.

Virgil Green, of Bullville, N. Y., says:

I have known Crows to strip a large cherry tree of its fruit when the cherries were beginning to ripen.

George Donaldson, of Gilbertsville, N. Y., says:

The Crow eats strawberries, blackberries, raspberries, and cherries.

Half a dozen other complaints of damage to cherries have been received. Apples are more rarely attacked, but a few reports of injury to this fruit are at hand, of which the following is one:

From E. M. Wilson, Belfast, N. Y.:

Crows sometimes seem to eat apples on the trees in the fall of the year, damaging the largest and finest fruit. However, I am not positive in this matter, the evidence being circumstantial, so to speak. Crows were seen in apple trees, and the fruit was now and then pecked and eaten on one side, plainly by a bird with a large beak. My father tells me that he has seen Crows eating apples in an orchard.

From the fact that Crows feed largely on wild grapes, it seems a little strange that they do not visit the vineyard more frequently, but as yet very few complaints on this score have been received. One vineyard of several acres lying just outside the limits of the city of Washington, D. C., has suffered considerable loss for several years from the frequent attacks of Crows. One of the assistant ornithologists visited it in September, 1886, and again in the same month in 1888, and found abundant evidence that the owner did not exaggerate when he stated his loss to be at least one-fourth of the crop. Not only were Crows frequently seen eating the grapes, but two which were shot during the first visit had grape seeds in their stomachs.

OTHER VEGETABLE FOOD OF THE CROW.

In addition to the fruits and vegetables already mentioned as forming a part of the Crow's food, there are very many wild fruits, berries, seeds, and nuts, on which the Crow feeds largely at times, but the consumption of which is of little account to the farmer under any circumstances.

The vegetable matter contained in the eighty-six stomachs examined was as follows:

Vegetable Contents of Stomachs.	No. of stomachs in which found.
Kernels of corn	35
oats	3
wheat	2
Remains of acorns or chestnuts	26
cherries, cultivated varieties	8
wild cherries	3
berries not identified	4
haw berries (<i>Crataegus</i>)	1
Fruit pulp, not identified	4
Seeds of grape	7
blackberries or raspberries	5
pumpkin	2
cucumber or musk-melon	1
beach plum	2
Virginia creeper (<i>Ampelopsis</i>)	2
dogwood or cornel (<i>Cornus</i>)	4
bayberry (<i>Myrica</i>)	3
common (harmless) sumachs (<i>Rhus</i>)	17
poison sumach and poison ivy (<i>Rhus</i>)	19
juniper or red cedar	1
bind-weed (<i>Polygonum</i>)	2
wild rice (<i>Zizania</i>)	1
Unidentified seeds	10
Sea-weed	4
Moss	1

The Crow is known also to eat the berries of the wintergreen, poke-weed, elder, smilax, and hackberry; and doubtless it also feeds upon numerous other berries and seeds.

During autumn, and especially in the districts where grain is not readily obtainable, a favorite food of the Crow is acorns, beech-nuts, or chestnuts, immense quantities of which are consumed. It may be mentioned incidentally also that in parts of Louisiana and Texas, and probably in other States, the Crow injures the pecan crop to a considerable extent.

THE DISTRIBUTION OF NOXIOUS SEEDS.

An interesting fact, which has come to light recently through the examination of Crow stomachs, is the discovery that the berries of poison sumach (*Rhus venenata*) and poison ivy (*Rhus toxicodendron*) are eaten in large numbers by the Crow.

The poison ivy (also called poison vine, poison oak, mercury or mercury vine, etc.), is too well known to need any description. The poison sumach (also called swamp sumach, poison elder, poison dog-

wood, etc.) is a shrub or small tree, confined mainly to swamps and wet places, and less generally known than the ivy, though its poison is much more powerful. Both species bear straggling bunches of greenish-white, waxy berries, which cling tightly to the stems through the entire winter and thus are readily obtained by Crows even when the ground is deeply covered with snow. Each berry contains a single large seed or stone surrounded by a small amount of wax-like pulp, which appears to contain considerable nutritious matter.

Stomachs of Crows taken in every month from September to March, and in different localities from Massachusetts to Florida, were found to contain these seeds, sometimes in large numbers. In one case one hundred and fifty-three seeds of poison ivy were found in a single stomach; in several cases the number was more than one hundred, and the average in nineteen stomachs exceeded fifty.

At a large Crow-roost on the Virginia side of the Potomac, near Washington, the droppings of the Crows are literally full of these seeds, usually accompanied by many seeds of the harmless (red-berried) sumachs, and a still smaller number of those of the flowering dogwood (*Cornus florida*) and the sour gum (*Nyssa*). The same is true of the large roost near Baltimore, Md., whence Mr. C. L. Edwards, of the Johns Hopkins University, sent to the Department seeds of all the above species more than a year ago. The seeds of poison ivy and poison sumach had been found previously in Crow stomachs collected near Washington, but for lack of a good reference collection of seeds they remained unrecognized until December, 1888, when they were identified by the writer.

In order to give some idea of the number of these seeds consumed by the Crow it may be stated that a single pound of the dried excrement taken from the roost in the national cemetery at Arlington, February 8, 1889, contained by actual count 1,041 seeds of poison ivy and 341 seeds of poison sumach, in addition to 3,271 seeds of other sumachs, 95 seeds of Virginia juniper, 10 seeds of flowering dogwood, and 6 seeds of sour gum. The material, which covered about four square feet, was taken at random from above the layer of leaves, and represents the average deposit on the roost. As the roost covers upward of fifteen acres, some idea may be formed of the number of these seeds deposited there.

It is a well-known fact that the germination of many kinds of seeds is hastened by their passage through the digestive organs of birds and other animals, and hence it was believed at once that the Crow was aiding in the distribution of these poisonous plants. In order to place the matter beyond question, however, seeds taken from the Arlington roost were tested in several ways, and not only was their vitality found to be unimpaired, but they were found to germinate more quickly than seeds taken from the vine. Of one hundred seeds of *Rhus venenata* from the roost, moistened and kept warm, ten sprouted within forty-eight hours, and twenty more within the next five days. One hundred and fifty seeds of the same kind and from the same source were planted in a flower-pot in the greenhouse, and at the end of fourteen days one hundred and thirty of them had become vigorous seedlings from one to two inches high, and several more were breaking the ground. Similar results were obtained with seeds of *Rhus toxicodendron* from the roost, while seeds taken from the vine had not sprouted at the end of fourteen days. Thus it becomes certain that these seeds are improved rather than impaired by their passage through the digestive organs of the Crow, and this bird

therefore is doing incalculable harm by sowing broadcast the seeds of a poisonous vine and a more poisonous shrub, both of which unfortunately are far too abundant already.

THE CROW AS A DESTROYER OF THE EGGS AND YOUNG OF POULTRY AND WILD BIRDS.

More than three hundred and fifty of our correspondents have contributed notes relating to the Crow as a robber of the nests of domesticated fowls and wild birds. About seventy of these state simply that "no damage of this kind has been observed," but with this exception the evidence is almost wholly unfavorable to the Crow. Two hundred and seventy-eight observers state distinctly that they know of more or less mischief of this kind committed by Crows. One hundred and forty-seven have personal knowledge of its carrying off young chickens, and one hundred and seventy-four report damage to domesticated fowls. There are twenty-five complaints of injury to the eggs and young of turkeys, and about a dozen instances of similar damage to ducks and geese.

Rather more than ten per cent. of the reports on domesticated fowls state that the damage is slight or occasional, but on the other hand upward of fifty observers report frequent and serious depredations, many of them stating that the Crows do much more damage than hawks. It is significant that out of more than three hundred and fifty replies to the question covering the subject of damage to domesticated fowls and wild birds only five are positively favorable to the Crow. Seventy others are negatively favorable in that they report no injury observed, without, however, giving any indication of the extent of the opportunities for observation. The reports of damage come from all parts of the United States and Canada where Crows are found, and as a rule the notes are clear and exact.

As one result of all the information thus far collected it may be stated that the Common Crow is a serious enemy of poultry, all the more dangerous because so often unsuspected, and because of its remarkable cunning and stealth. It is also a skilful and inveterate robber of the nests and eggs of wild birds.

The entire evidence submitted on this subject is well worth reading, but lack of space forbids the insertion of more than a few examples under each of two heads.

DESTRUCTION OF THE EGGS AND YOUNG OF POULTRY.

More than one-third of all the reports relating to damage to poultry specify frequent or serious loss. It appears from these notes that not only does the Crow rob the hens, ducks, and turkeys which steal their nests in the brush, woods, or meadows, away from the farm-yard, but it frequently comes within a few steps of the house or barn, destroying all nests not absolutely inaccessible to it or snatching up the downy young about the very doors. Usually such visits are made very early in the morning, or at times when no one is at hand to prevent the theft, but frequently the robber becomes emboldened by success and makes his visits in the middle of the day and with apparent disregard of all danger. Moreover, as in the case of some hawks and dogs, certain individuals become particularly addicted to chicken stealing, and return day after day to the same place, seldom failing to secure a victim at each visit.

The following notes from different parts of the country will serve to illustrate the Crow's methods in relation to eggs and chickens:

From Owen Durfee, Fall River, Mass.:

May 5 [1888], while walking by a farm-house near the city, I saw a Crow sail over the house and finally settle down on a stone wall about 100 feet from the house, and begin watching the young chickens running about in the lot and through the wall under him. One of the chickens ran under him, and after eyeing it a moment, he turned to the next one, which was perhaps a week or ten days old. When this one was about six feet from him, he dropped down over it and struck at it two or three times with his beak. Then he acted as though about to eat it on the spot, but a young rooster running at him, he picked up the chicken and carried it off still squawking in his beak.

From William H. Lewis, Pawtucket, R. I.:

I have known the Common Crow to take chicks when they were from one to six weeks old. I know of a case where twenty have been lost this season.

From H. Nehrling, Freistatt, Mo.:

I have frequently observed Crows stealing the eggs from my poultry-yard. They do this very slyly and quietly. As soon as the eggs are hatched they carry off young chickens whenever they can get them. With the exception of Cooper's Hawk I do not know such a bold robber as the Crow. One day in April one of these birds perched on the fence, only a few steps from my house. An old hen with about a dozen chickens which were only a few days old was in my barn-yard. Suddenly the Crow swooped down, caught a chicken with its bill, and went off, flying away near the ground. In a few weeks the Crows carried off about twenty chickens, which varied in age from one day to four weeks.

From H. R. Landis, Landis Valley, Pa.:

When the young are hatched the Crows are very bold, coming up to buildings, and in one case that came under my notice they took from one to four chickens each morning, nearly annihilating a brood of about one hundred.

From J. W. Van Kirk, Milton, Pa.:

I have seen Crows catch young chickens, and frequently have seen them carrying off eggs of both the domestic fowl and wild birds. We have had on different occasions whole nests of sitting turkeys and chickens robbed by them. In some cases the eggs were taken from under the hens while on their nests.

From David A. Vail, Atlanticville, N. Y.:

On several occasions I have known the Crow to catch and carry off young chickens from the hen-yard. I have known him to return regularly every day for a chicken, and get it, too, unless some one was on the watch to frighten him away.

From J. V. Henry Knott, Kingston, N. Y.:

I have seen the Common Crow eat eggs, and have caught him by baiting a steel-trap with an egg. The man in charge of the gas-works at Saugerties told me this spring that he had to cover his chicken-yard with wire to save the chickens from the Crows, and that he saw them catch the chickens repeatedly.

From W. K. Nelson, Augusta, Ga.:

The Common Crow will steal eggs; I have poisoned the eggs and killed the Crow.

From Frank B. Hancock, Casky, Ky.:

The Common Crow undoubtedly catches young chickens and steals eggs. They have caused me more trouble in that respect than hawks. My home is situated on the south side of a woodland. A colony of Crows located in that woodland in 1870. This spring (1885) I have watched them carefully, and have seen them steal chickens before they were past the *downy stage* and carry them away to their young. I have one Crow family charged with \$25 worth of nice chicks stolen in April and May, 1885.

Occasionally the Crow attacks full-grown fowls, as evidenced by the following notes:

From George A. Boardman, Calais, Me.:

The Common Crow has been observed to catch young chickens and steal eggs, and also full-grown hens.

From Erney Tulley, Penza, Ohio:

I have never known of Crows killing young chickens, but I once surprised two Crows fighting an old hen in a little bunch of willows, and have no doubt that they would have killed her in time had I not interfered.

In all probability these were cases in which the hens were weak and partially disabled, or else the Crows were driven to desperation by hunger, and took advantage of unusually favorable circumstances.

The following reports show that the Crow uses the same methods on turkeys, ducks, and geese as on chickens:

From W. V. Hardy, Holman Station, Ind.:

In the spring of 1885 the Crows visited our turkeys' nests every day, also geese, nests, doing a great amount of damage.

From F. H. Holmes, Rio Vista, Cal.:

On the Lower Sacramento River, I knew of one Crow which killed no less than thirteen young ducks in the space of three days during a cold, rainy spell in February, though otherwise I never knew it to do any damage to young poultry.

From Fred. S. Odle, Lapeer, Mich.:

Two years ago in this locality I noticed an instance where Crows stole eggs from a duck's nest, and carried them nearly a quarter of a mile to their own nest. I found an egg on a stump about half way, with only two claw marks in it. The nest of the Crow was in a small pine and had young in it at the time.

From Gideon Mabbett, Rodney, Miss.:

I have seen Crows come to the house and carry off nearly the whole setting of young ducks in one day.

From John A. Weems, Flora, Ala.:

The Common Crow is the worst egg thief I ever had to contend with. I have never known Crows to catch young chickens, but they have destroyed at least one hundred turkey eggs for me during the last spring and early summer.

From D. E. Pannepacker, Chalfont, Pa.:

On May 15, 1888, while I was slowly making my way through the forest, I noticed a Crow some 150 yards ahead of me. I thought his peculiar antics meant something, and upon coming closer to him I noticed that he was teasing a setting turkey. I found too that he was not alone, but was assisted by his mate. He ran up to the turkey, seized hold of its tail feathers, and then when the turkey rose to defend herself against his impudence, his mate ran up in front of the turkey, thrust his beak through an egg and flew off to his nest. In about fifteen minutes they returned, but by some means or other became aware of my presence and flew away, nor did they return at any time while I watched them, though they managed eventually to steal eleven out of thirteen of the eggs.

From Thomas W. Florer, Waxahachie, Tex.:

A farmer's man here had a brood of some fifty turkeys, and a Crow having a nest of young in a neighboring wood commenced appropriating the young turkeys until the brood was reduced to fifteen. These were kept close until as large as quails and there was no further molestation.

In connection with this habit of the Crow the most favorable report received came from Mr. J. M. Nipp, of Bolton, Mo., who says:

Individual members of the Crow family, like those of the human family, are capable of learning bad habits.

Less than one Crow in twenty learns to steal eggs or young chickens, and they are only bad when feeding their young. Two years ago last spring one got to tak-

ing chickens from our yard. I watched him fly to the nest, and next morning when the sun was an hour high I killed the young Crows to see what they had been fed on for breakfast. They had been fed one chicken, eight mice, and twenty-two grasshoppers. It was easy to count the chicken's feet, mice's tails, and grasshoppers' heads when the five pouches were opened.

DESTRUCTION OF EGGS AND YOUNG OF WILD BIRDS.

No observant person will deny that the Crow does serious damage to the eggs and young of wild birds. The instances of such depredation which have come within the knowledge of most farmers or other persons living in the country are far too numerous to leave a shadow of doubt on this score in any unprejudiced mind.

Yet for every instance of such robbery witnessed by man thousands must take place without his knowledge. Persecution by Crows is doubtless a very large factor among the influences which cause so many birds to crowd about human habitations during the nesting season, and yet the relentless Crow follows them even to the eaves and window-sills of houses, taking their eggs and young in spite of every precaution.

The evidence on this point, contributed by our observers during the past few years, is replete with accounts of such forays, and the only wonder is that robins, thrushes, blackbirds, and many other species continue to rear any young at all. The reports on this subject number one hundred and fifty or more, and contain minute descriptions of the destruction by Crows of the eggs or young of more than twenty-five species of wild birds. The list includes the robin, wood thrush and other thrushes, brown thrasher, wrens, English sparrows and other sparrows, blackbirds of several species, Baltimore and Bullock's orioles, woodpeckers, swallows, kingbirds, wax-wing, warblers, bluejay, Carolina dove, quail, prairie chicken, woodcock, night herons and other waders, wild ducks, and sea-gulls. In addition to these specific statements, very many observers state that all kinds of small birds suffer from Crows, while others say that it kills "many kinds" or "all kinds which can be obtained."

Naturally the robin is one of the most frequent sufferers, and perhaps its losses are more likely to be noticed than those of less familiar birds. The following reports indicate something of the nature and extent of the inroads upon this species:

From Prof. F. E. L. Beal, Lunenburg, Mass.:

I have known the Crow to rob the nest of a robin of its eggs on several occasions, always at the first peep of light. In one instance the nest robbed was within six feet of the open window of a chamber where I slept.

From Charles F. Goodhue, Webster, N. H.:

The Crow has been known to rob every robin's nest in a good-sized apple orchard, and to come within eight rods of the house and carry off four young robins in the course of one day.

From J. W. Van Kirk, Milton, Pa.:

Last spring (1886) out of ten robins' nests around our building, nine were robbed of eggs by the Crow. One of the nests was not over 20 yards from the house. The robin lays from three to five eggs, and you can safely say that at least forty robins were thus destroyed inside of eight acres of ground.

From Dr. A. K. Fisher, Sing Sing, N. Y.:

A great number of nests of the robin, wood thrush, and in fact many other birds, are robbed of their eggs, and I have often observed Crows flying away with young birds in their bills, followed by the outraged parents.

In examining the contents of Crows' stomachs in spring, I have detected the presence of birds' eggs in a number of cases.

Such instances might be given by the score, but we have space only for enough samples to show that we have not overestimated the extent of the mischief or the number of species which suffer.

From C. S. Paine, East Bethel, Vt.:

Crows come into our shade trees early in the morning and take the eggs and young of the oriole and robin; I think that over half of the nests of our small birds are destroyed by them.

From William Proud, Chico, Cal.:

Crows destroy great numbers of eggs and young of small birds. The hanging nest of the oriole (*Icterus bullocki*) seems to be a favorite mark for them.

From D. Y. Overton, Burlington, Iowa:

The Common Crow, especially at the East, is an inveterate robber of birds' nests, and also destroys their young. I have seen him at the nests of the robin with the eggs in his mouth; and have seen him with young bluejays in his beak as he took them from the nest.

From Dr. Frank H. Braymer, West Pawlet, Vt.:

The Crow eats the eggs and young of other birds, particularly of the robin, wax-wing, thrush, etc.

From Charles A. Davis, Burlington, Vt.:

I have seen Crows catch and carry to their nests eight or ten young bank swallows which were feathered out.

From Manly Hardy, Brewer, Me.:

It destroys the eggs and young of all birds whose nests it can reach. I have seen night-herons' eggs thus destroyed by the hundred.

From Samuel N. Rhoades, Haddonfield, N. J.:

The Crow steals eggs and young birds from the purple grackle, red-winged black-bird, robin, kingbird, Carolina dove, quail, and woodcock. It also destroys the eggs of several species of herons.

The last report and the two following may interest sportsmen, as they illustrate a very common habit of the Crow, and one which will account in a large measure for the decrease of game birds in some parts of the country.

Prof. D. E. Lantz, of Manhattan, Kans., writes:

I have not known the Crow to trouble the poultry-yard in Kansas, but it is a noted robber of the eggs of quail and pinnated grouse.

Dr. A. B. MacCrea, of Berwick, Pa., writes:

A friend was mowing in the meadow this summer (1885) and uncovered a quail's nest containing some twenty eggs. He concluded to place them under a hen and went to the barn for a basket; when he returned a Crow was finishing his dinner on the last egg.

In all the dark history of the Crow's relations to other birds there is nothing which can be fairly called a bright spot, and only here and there a record is found which serves to render the page a little less gloomy. One of these grains of comfort is found in the fact that in its wholesale attacks on other birds a few species suffer which are scarcely better than itself. The bluejay and the purple grackle are known to destroy the eggs and young of smaller birds, and their own nests are frequently pillaged by the more powerful Crow. Under favorable circumstances Crows are known to destroy the eggs and young of the English sparrow, and they have done good service in this way about the Smithsonian Institution, in Washington, D. C.,

where it is no uncommon sight during the summer to see a Crow (most often perhaps the Fish Crow) feeding on the young of these birds.

INSECT FOOD OF THE CROW.

In attempting to study the insect food of the Crow, two different questions present themselves at the outset. These are: (a) How many insects does the Crow eat? and (b) What kinds of insects does it eat? The first question was answered in a general way more than half a century ago, and there is no reason now to deny the oft-repeated statement that the Crow feeds largely on insects. The second question, however, is not only much more important but much less easily answered; for not all insects are injurious, and comparatively few persons can discriminate between the useful and harmful, especially when watching them from a distance or examining those which have been crushed and swallowed by a bird.

While, therefore, the field-notes of casual observers may help materially to answer the question as to the extent to which the Crow feeds on insects in general, they can seldom be relied upon for an accurate knowledge of the insect species destroyed. As already stated, this latter question must be answered mainly by the critical study of the stomach-contents of large numbers of Crows. Nevertheless, the accumulated observations of years as to the Crow's manner of feeding, together with notes on places most visited at certain times, and the insects most abundant in those places at such times, must not be disregarded, many such observations being of the greatest practical value.

In the course of the present investigation on the Crow, hundreds of notes on its insect-eating habits have been received from correspondents, and in many cases the observations are of great interest and value. Not a few of these notes relate to observations made under peculiarly favorable circumstances, and though we can not feel perfectly sure of the correct identification, for example, of the Hessian fly and army-worm, we see no reason to doubt the statements of any farmer as to grasshoppers and potato beetles, or even cut-worms and "white grubs." It is true they may not know the scientific names of the particular species of grasshopper or grub noted, but the observation, though less valuable on this account, is still of definite worth. A few observers have examined stomachs of Crows occasionally, and their testimony in regard to the insects found therein therefore possess unusual value, but the larger number by far base their statements entirely on field observations.

A few farmers contend that the Crow rarely or never eats insects of any kind, while others simply state that they have never seen it do so, and express a favorable or unfavorable opinion as to the probability of such a habit. These, however, are individual exceptions, the great majority of observers stating emphatically that the Crow does eat insects, and that he eats many; in fact, the unanimity of opinion on this point is rather surprising, and much of the most favorable testimony comes from men who are most severe on the Crow as regards its other habits.

In this connection, the evidence furnished by the stomachs examined in the Division during the past year is interesting. The insects contained in these stomachs have been submitted to the Entomologist of the Department, and a summary of the results of his examination will be found in another place; but while examining the other

components of the food it was easy to separate the insect material from the rest, and to estimate the proportion which it formed of the entire food.

The following table, showing the amount of insect food in the stomachs examined, contains several points of interest:

Table showing the amount of insect food in the stomachs of eighty-six Crows (Corvus americanus), arranged by months.

Month.	No. of stomachs examined.	No. of stomachs containing insects.	Percentage of stomachs containing insects.	Average percentage of insect food in stomachs containing it.	Average percentage of insect food in all stomachs examined.
January	14	4	28.6	7.	2.
February	6	1	16.7	1.	.17
March	1	1	100.	1.	1.
April	0				
May	3	3	100.	76.	76.
June	3	3	100.	14.7	14.7
July	16	14	87.5	32.6	28.5
August	0				
September	7	6	85.7	33.	28.3
October	13	10	76.9	12.8	9.8
November	3	3	100.	17.3	17.3
December	20	18	90.	5.9	5.4
	86	63	73.2	19.7	14.5

It appears from the above table that sixty-three of the eighty-six stomachs of the Common Crow which were examined, or more than 73 per cent., contained some insect food, the average amount in each of the sixty-three stomachs being nearly 20 per cent., or one-fifth of the entire food. Fourteen and one-half per cent. of all the food contained in the whole eighty-six stomachs consisted of insects, and this in spite of the fact that two-thirds of these stomachs were from birds taken during the colder half of the year, namely, between October 1 and April 1.

At first sight it seems still more remarkable that 90 per cent. of the stomachs taken in December contained some insect food, while but 87½ per cent. of those taken in July contained insects. Those taken in July, however, contained in the aggregate more than five times as much food of this kind as those taken in December.

Again, of the fourteen stomachs taken in January, but four contained insect remains, as against eighteen out of twenty taken in December. By consulting the detailed results of the examination, however, the reason is evident; for ten of the January birds were taken at East Hartford, Conn., when the ground was mostly covered with snow, while most of the December birds were taken near Washington, D. C., when the ground was mostly bare.

These few facts show how essential is the examination of large numbers of stomachs in order to secure accurate results, but nevertheless it is impossible to avoid the conclusion that Crows eat insects freely at all seasons of the year, and that the main reason why they do not eat as many in cold weather as in warm is simply because they are not to be had then. These conclusions receive additional confirmation from the reports of observers, very many of whom state that the Crow feeds on insects at all times of the year, but is especially destructive to them when they are exceptionally abundant.

Turning now to the reports of observers as to the *kinds* of insects eaten, we find additional testimony favorable to the Crow.

The following list gives the names of all insects on which the Crow is said to feed, together with the number of observers reporting each kind:

Names.	No. of reports.	Names.	No. of reports.
Insects of all kinds.....	11	Army-worms.....	3
Insects, kind not specified.....	54	Tobacco-worms.....	2
Grasshoppers.....	80	Earth-worms.....	7
Crickets.....	8	Worms, kind not specified.....	10
"Locusts".....	4	Ants.....	2
Seventeen-year cicada.....	2	"Bugs," kind not specified.....	6
"White grubs".....	32	Tent caterpillar.....	1
Grubs, kind not specified.....	49	Apple-tree worm.....	1
Cut-worms.....	44	Canker-worm.....	1
May beetles.....	5	Corn-worm.....	1
"June bugs".....	2	Bud-worm.....	1
Potato beetles.....	6	"Millers".....	1
Beetles, kind not specified.....	13	Hessian fly.....	1
Caterpillars.....	7	Cocoons.....	2
Wire-worms.....	6	Crysalids.....	2

A glance at the above list shows that certain groups of insects are reported by large numbers of observers, and it is interesting to note that in almost every case the insects so reported are decidedly injurious. Thus grubs and "white grubs" aggregate eighty-one reports, cut-worms are mentioned in forty-four, and grasshoppers in eighty.

Among the numerous reports which mention a considerable variety of insects the following may be instanced:

From William Proud, Chico, Cal.:

It is a great devourer of grubs, caterpillars, chrysalises, etc.; including wire-worms, larvæ of cockchafer, beetles, army-worms, grasshoppers, and any other noxious vermin that falls in the way.

From Marcus S. Crane, Caldwell, N. J.:

It frequently visits newly plowed fields for grubs and worms, and I think it also searches for cut-worms in the corn-fields. I have noticed Crows feeding in a meadow the morning after it was mowed, and think they destroy a great many grasshoppers, bugs, and caterpillars.

From Elisha Slade, Somerset, Mass.:

Crows feed upon injurious insects at all times of the year, and very sensibly reduce the number of cut-worms, larvæ of the May bug, and the bugs themselves, wire-worms, and various caterpillars which infest the field, orchard, pasture, and meadow. From more than a quarter of a century's observation, I consider the Crow of more benefit to the agriculturist in its destruction of insects than injury to the grain, eggs, and chickens; I am a farmer myself and have had several disastrous visits from the Crows.

From Dr. Morris Gibbs, Kalamazoo, Mich.:

The Crow has been observed to feed upon injurious insects, such as orthoptera, coleopterous larvæ, and chrysalids of lepidoptera, especially *Cecropia* cocoons.

From Dr. Hiram A. Cutting, Lunenburg, Vt.:

It has been observed to eat caterpillars, potato beetles, and grasshoppers; also white grubs and cut-worms.

Very many farmers must have noticed the habit which the Crow has, in common with various blackbirds and some other species, of

following the plow, especially in spring or early summer, or of frequenting recently plowed fields. The Crow, under these circumstances, is generally credited with destroying large numbers of grubs and other insects, and there can be little question that this reputation is fully deserved.

The following notes, selected almost at random from a large number, will give a fair idea of the evidence on this point:

From E. E. Mason, Accotink, Va.:

I have had them follow me all day when I have been plowing, picking up the grub-worms. They are evidently voracious feeders and not nice as to diet, but doubtless draw the line on any of the caterpillar family. A friend of mine having shot one cut his craw open and found so many insects that he said he had killed his last Crow. I think if the Crow was less disturbed there would be less wormy roasting ears.

From F. Stephens, San Bernardino, Cal.:

The Crow is in the habit of following after the plow, picking up cut-worms, white grubs, larvæ, etc., sometimes in large quantities.

From T. Scott Fisher, East Brook, Pa.:

I watched a pair of Crows follow me day after day last spring [1886] while plowing sod, and saw one Crow pick up twenty-five to forty white grubs, cut-worms, and wire-worms at one time and then fly to the woods for an hour or so, then back and at it again.

No doubt the Crow does very much good in this way, and it is possible that the observed facts of this kind have led some people to believe, without other evidence, that Crows when pulling up corn are only in search of insects. Much interesting opinion has been contributed on this subject, together with no little good evidence. The following samples serve to illustrate the subject:

From Dr. J. R. Mathers, Buckhannon, W. Va.:

It is the opinion of many farmers that the Crow is unearthing cut-worms at the base of the corn instead of pulling up the corn, the uprooting being only an accident.

From William G. Coutan, Brackney, Pa.:

I am convinced from personal observation that the Crow pulls corn in search of grubs and worms. For where large quantities have been pulled up the grain is left intact on the sprout.

From F. R. Welsh, Philadelphia, Pa.:

On three or four occasions I have known Crows to pull up corn from two to four inches high. I do not think they eat the green top; their object seems to be to get at the seeds, which they invariably eat.

From John C. Linville, Gap, Pa.:

It feeds largely on the large white grub, the larvæ of the May beetle. When the common cut-worm is very numerous I have seen the Crow dig something out of the hill of corn and leave the corn unmolested; I think he was catching the worms.

From D. E. Pannepacker, Chalfont, Pa.:

A field of corn is adjacent to my school-house. On the 13th of May the corn was planted, and on the 22d of May I first noticed the tender shoots above the ground. The field previous to the cultivation was covered with a thick growth of sod, favorable to the existence of the grub and wire-worm. It was but natural, too, for these insects to remain, and not having the tender shoots of timothy, clover, and other grasses to satisfy their appetites, they turned their attention to the growing corn. The despised Crow here rendered most excellent service, for though he pulled up the corn, I noticed each time the well known track of the wire-worm, or the worn path of the grub.

The fact that Crows usually eat the corn from the sprouts which they pull has been spoken of in another part of this article, and is

too well known to need any demonstration. That they sometimes leave part of it untouched after pulling is also undoubtedly true, but this can hardly be used as an argument to show that it was pulled for other purposes. Where food of any kind is very abundant, the Crow probably selects the morsels which please him best, and the fact that some is left untouched only shows that he exercises his judgment in selecting his food.

An observation which has been used sometimes as an argument for the Crow is the fact that the greatest damage to corn by the Crow is in precisely the localities where the greatest injury is done by cut-worms and grubs, namely, on pasture land, mowing land, or newly cleared fields which have been broken up and planted in corn. The natural inference is that the Crows are attracted by the abundance of grubs, and incidentally do more or less mischief to the corn; but a moment's thought will show that a simpler explanation lies in the fact that such newly broken fields are generally those farthest from the farm-house, and hence less easily protected, so that the Crow seeks them in preference to the more exposed fields, and without reference to the abundance of insects there. The obvious test of guilt or innocence in such cases would be to shoot a few Crows after they have spent some time in the field and subject their stomachs to careful examination. The claim so often made that such a test would show nothing, since the soft worms would digest more rapidly than the corn, has no weight whatever, for all grubs capable of injuring corn have hard jaws or other parts which are not only indigestible, but which often are so characteristic as to make it an easy matter to identify the particular species of grub, cut-worm, or caterpillar to which they belong.

On the whole, the evidence thus far collected does not seem to give much weight to the belief that Crows eat many grubs or cut-worms in fields where corn is coming up. Nor is there any obvious reason why they should, since the grubs are more abundant in grassy fields than in cultivated ground, and, except at times when the surface has been recently disturbed, we should expect the birds to look for them anywhere rather than in corn-fields.

When edible insects of any kind are particularly abundant, birds doubtless feed more largely on them than at other times. This is well shown by the numerous published reports of the havoc wrought by birds among the seventeen-year cicada in the years of its great abundance.

The following statement by Mr. J. Percy Moore, of Philadelphia, Pa., is one of several reports showing that the Crow is no exception to this rule. Mr. Moore writes:

When the seventeen-year cicada appeared this summer (1885) the Crow fed extensively on both its pupæ and imagoes. The young were fed to some extent on the pupæ on May 30. As they had not at this time appeared above the ground, I suppose the Crows obtained them in plowed fields.

THE CROW AN ENEMY TO GRASSHOPPERS.

Probably the most marked example of the good which Crows do by destroying insects is found in their attacks on grasshoppers, crickets, and kindred insects. Eighty observers report the Crow as feeding extensively on grasshoppers, and there can be no doubt that much good is done in this way. The following examples show something of the extent of the benefit occasionally done:

From Charles F. Goodhue, Webster, N. H.:

At this season Crows are of some benefit to the farmer, as they feed mostly on grasshoppers. To-day (August 22) a flock of nearly a hundred were observed in a pasture badly infested with grasshoppers, upon which they evidently were feeding.

From A. I. Johnson, Hydeville, Vt.:

Crows have some very good qualities, catching countless numbers of crickets and grasshoppers after the hay is cut. They can be seen at almost any time of day on the meadows catching grasshoppers. I observed one pair of old Crows this summer (1885) when I was haying, that were feeding their young almost entirely (if not quite) on grasshoppers: the old Crows would alight on the mown land within eight or ten rods of me, and after catching a hopper or two would fly to their young that were on the fence and there feed them with the hoppers.

From W. E. Saunders, London, Ontario, Canada:

Last summer (1885) I watched a flock of probably two thousand Crows catching grasshoppers.

From J. B. Underhill, Fork Union, Va.:

As to the insect diet of the adult I can not testify, having never examined the gizzards. The gizzards of two young which were taken from the nest were filled to overflowing with grasshoppers, and each contained one or two kernels of corn.

From Morris M. Green, Boonville, N. Y.:

Near Boonville I have seen the Common Crow feeding on grasshoppers during the summer months. Some fields seemed to be fairly black with the birds pursuing the grasshoppers in every direction. One day noticing a flock of Crows frequenting a particular field, I visited the place, and found that the roots of the grass had been completely eaten away, so that the sod or turf could be taken by the hand and rolled up like a rug or carpet. A farmer living in the vicinity told me that the Crows visited the place every day to feed upon the grubs that destroyed the turf in this way. The grubs or larvæ were about three-fourths of an inch in length; body whitish, with some dull plumbeous underneath; head blackish.

Many other reports of similar work might be cited, but the above will suffice. We may add, however, that, judging from the numerous reports received, Crows regularly visit new-mown fields for the purpose of eating the grasshoppers thus left exposed. Probably a score of observers have noted this fact in their reports.

DO CROWS EAT POTATO BEETLES?

Among the reports received are six or more which mention the potato bug or potato beetle among the insects which are eaten by the Crow. George H. Berry, of North Livermore, Me., says:

It eats grasshoppers, potato bugs, and *Cleisiocampa* larvæ [tent caterpillars].

Charles W. Beckwith, of Frederickton, Canada, says:

It eats the Colorado potato beetle to a small extent, not enough to be of much apparent benefit.

W. E. Dingman, of Newton, Iowa, says:

I have observed it feeding on the potato bug and grasshoppers, quite extensively on June 21, 1886.

Other observers make similar statements, while still others say that it has never been seen to eat this beetle at all, and even appears to shun it altogether. Mr. W. B. Hall, of Wakeman, Ky, states that he could not in any way tempt his tame Crows with potato bugs. His account of the insect-eating habits of his pets is so interesting and suggestive that it is inserted here entire:

Crows are decidedly insectivorous if domestication does not alter their habits. At different times I have kept Crows which were taken from the nest when nearly full fledged. They became very tame so that I had a chance to watch their actions and manner of feeding. I find that they are not particular in their diet as to

whether the insect is what is termed injurious or beneficial. They feed greedily on the different species of cut-worm (*Agrotis*), and on the white grub (larva of *Lachnosterma fusca*). When plowing they will follow in the furrow and pick up every grub or beetle in sight; and when their appetites are satisfied they fill their beaks with insects and hide them under sticks, leaves, or stones. I have often taken the pains to look up their hiding places and count the insects thus hidden and I have been astonished at the numbers. They kill predaceous beetles but do not often eat them, I think on account of the peculiar odor most of them emit. For the sake of experiment, I have taken the Crows to a board or stone which on being removed exposed many black beetles (mostly *Galerita*). They would pounce on a beetle, give it a pinch through the head or thorax, drop it, and seize another with such rapidity that but few if any escaped. I could not on any condition tempt their appetites with Colorado beetles, squash bugs, cucumber bugs, or any of the soldier bugs or lady birds (*Coccinella*). I had a male Crow that would eat the cabbage caterpillar (*Pieris rapae*) with evident relish while his mate disdained such plebeian diet. They would kill the sow bugs (*Oniscus*) and species of Myriapoda, but would not eat them.

THE INSECT FOOD OF THE CROW AS REVEALED BY EXAMINATION OF STOMACHS.

Among the eighty-six stomachs of the Common Crow examined, sixty-three were found to contain insect remains, and these remains were submitted to the Entomologist of the Department, Prof. C. V. Riley, who caused a critical study of them to be made, and has in preparation a full report, showing the number and kinds of insects represented in each stomach, with notes as to their habits and economic importance. A brief summary of the more important facts brought out by this investigation is given herewith. It has been prepared by the writer from a preliminary report to the Entomologist by Tyler Townsend, assistant, who, with the aid of the other members of the entomological force, made most of the determinations. The full report will appear in a bulletin on the Crow, which is now in preparation in the Ornithological Division.

The stomachs examined contained the remains of about ninety-two species of true insects, represented by about five hundred specimens. About 10 per cent. of these can not be classed properly as either beneficial or injurious, and the remainder are divided pretty evenly between the two. The following table shows the orders represented, as well as the number of species and individuals in each, and these are further classified under the heads beneficial, injurious, and neutral:

Table showing the nature of the insect food in sixty-three stomachs of the Common Crow.

	Species.				Individuals.			
	Bene- ficial.	Inju- rious.	Neu- tral.	Total.	Bene- ficial.	Inju- rious.	Neu- tral.	Total.
Hymenoptera.....	16	1	0	17	126	8	0	134
Lepidoptera.....	0	6	0	6	0	16	0	16
Diptera.....	1	0	0	1	1	0	0	1
Coleoptera.....	23	16	8	47	85	57	32	174
Hemiptera.....	1	1	1	3	1	1	1	3
Orthoptera.....	0	17	0	17	0	150	0	150
Neuroptera.....	0	0	1	1	0	0	18	18
Total.....	41	41	10	92	213	232	51	496

In addition to the true insects mentioned above, the stomachs contained remains of at least three species of spiders and two of myriapods, sixteen specimens in all, and all beneficial.

The order Coleoptera (beetles) is most numerously represented, and a majority of the species are beneficial. It is an interesting fact that no less than eighteen species of predaceous beetles (*Cicindelidæ* and *Carabidæ*) are included in this number, together with nearly a dozen species of the scavenger beetles (*Scarabæidæ*). Some of these are species possessing disagreeable odors, and it is somewhat surprising that the Crow should take them unless other food was scarce. They occur most abundantly, however, in stomachs taken in May, June, and July, when other food must have been abundant. Among the injurious beetles identified are the flat-headed apple-tree borer (*Chrysobothris*), of which a single specimen was found; May beetles (*Lachnosterna*) in five stomachs (nine specimens in one); and a few other borers and leaf-feeders. Three small weevils were taken from one stomach and considered "injurious insects," as they are, but it is probable that they were hidden in kernels of corn which were eaten by the Crow.

The order Orthoptera (grasshoppers, crickets, etc.) is well represented by one hundred and fifty specimens belonging to seventeen species. Twenty-eight stomachs contained examples of this order, and the results of stomach examination in this case bear out the statements of observers and show that in this direction the work done by the Crow is entirely beneficial, as all these insects are more or less injurious.

The order Hymenoptera, including the wasps, bees, ants, etc., is represented, in the material taken from the Crow's stomachs, by one hundred and thirty-four specimens belonging to seventeen species, all but one of which are beneficial. A species of saw-fly, decidedly injurious, was found in one stomach, and seven larvæ of the same or another species in a second stomach. One of these stomachs, however, also contained the remains of a young bird, apparently a nestling, and it is not improbable that the saw-flies came from this source. Two other stomachs contained remains of ichneumon flies belonging to different genera. These are among the most beneficial of insects, destroying particularly large numbers of caterpillars.

Only one other order requires special mention, viz, the Lepidoptera. In this are included the butterflies and moths, the larvæ of which are almost invariably destructive. Contrary to what might have been expected, the Crow stomachs do not show many representatives of this order. Six species, five of which are decidedly injurious, were recognized, but the sixteen specimens were distributed among nine stomachs. The family *Noctuidæ*, which includes the cut-worms, was represented by nine specimens in six stomachs; that is, but six Crows out of eighty-six had eaten any cut-worms.

In concluding this imperfect summary of the insectivorous habits of the Common Crow it must be conceded that the showing is not very favorable for the bird.

Considering merely the testimony of observers, the conclusion would be favorable in the main, for it appears that the Crow eats insects throughout the season, at many times in large quantities, and often of the most injurious kinds. To be sure they are mainly terrestrial or subterranean kinds, but they are decidedly injurious in the main, and few if any beneficial insects are said to be taken.

In the light of the stomach examinations, however, the case assumes a different complexion, for although the evidence from this source confirms in some respects the testimony of observers, it indicates also that beneficial and injurious insects are taken in

nearly equal quantities, and thus the good done at one time may be fully neutralized at another. The force of this point is much weakened by the small number of stomach examinations made, and by the fact that so few Crows were taken during the summer months; but the *indications* point to an omnivorous habit in general, and to the destruction of good and bad insects indiscriminately.

As has been suggested by many previous writers and reiterated by numbers of our own observers, the harm done in the destruction of eggs and young of insectivorous birds during spring and early summer is beyond all computation; and it is difficult for one familiar with the magnitude of the Crow's iniquity in this direction to believe that any destruction of injurious insects or other animals can fully atone for it. Yet even here another factor should be taken into account, as it must be borne in mind that many of the small birds killed by the Crow are not strictly insectivorous, while some of them, in their thefts of fruit and other crops, continually tend to even their own accounts with the farmer, and occasionally even overdraw them.

THE CROW AS AN ENEMY TO FIELD MICE AND OTHER SMALL QUADRUPEDS.

Aside from the insect-eating habits of the Crow its most beneficial trait probably is the killing of field mice. Of these it is a great destroyer, hunting up the nests and devouring young and old whenever they can be caught. There is abundance of evidence that Crows are very skillful at such hunting, and undoubtedly they form one of the strong checks on the increase of these prolific and destructive rodents. Among the reports of our correspondents are twelve which mention this habit of mouse-hunting, and from these we select a few:

From James O. Whittemore, Fairfield, Me.:

I have observed Crows catching insects and field-mice all the year round. The general impression among farmers is to tolerate Crows at all seasons except the early spring.

From O. P. Hitchings, Winfield, N. Y.:

The Crow has the reputation of catching field-mice, especially just after the grass has been cut.

From F. A. Sampson, Sedalia, Mo.:

After mowing I have seen Crows feeding on what I supposed to be grasshoppers; they also catch and eat mice.

We have received one report also from William J. Howerton, of Florence, Ariz., who writes as follows:

The Common Crow of this section is of some economic value, as I have observed it catching and killing the common pocket gopher.

MISCELLANEOUS ANIMAL FOOD OF THE CROW.

Probably no family of birds in existence is more truly omnivorous than the Crows; almost anything eatable is utilized when hunger presses, though at other times they are more scrupulous about their food. It is useless, therefore, to attempt to give a complete category of the items which may enter into the Crow's diet, and as many of them have no bearing on the economic aspects of the question it is

unnecessary to dwell on the subject here; any one who is curious to know exactly what ninety-eight Crows had eaten just before they were killed can consult the list of stomach examinations with which this paper concludes.

The animal matter contained in the stomachs of eighty-six Common Crows examined was as follows:

Animal contents of stomachs.	No. of stomachs in which found.
Carrion	14
Remains of mice	4
snake	1
frogs	5
salamander	1
fish	9
crayfish	6
other crustaceans	5
mussels or clams	4
snails of various kinds	6
insects	63
spiders	2
myriapod	1

The following statement from Mr. John M. Richardson, of Daingerfield, Tex., is interesting in this connection from its novelty. Mr. Richardson writes:

The Crow is known to catch young terrapins, and there is reason to believe that it destroys other small reptiles. I remember a rock-crowned hill on the east bank of the Wateree, between Manchester and Statesburgh, in Sumter County, Ga., that was almost covered with remains of small terrapins and land tortoises carried there, killed, and devoured by Crows.

THE CROW AS A SCAVENGER.

The eighty-six stomach examinations of the Common Crow showed food in but fourteen cases which could properly be called carrion; but it is a well-known fact that during seasons of scarcity Crows eat large quantities of carrion. Nevertheless the good done in this way has been very greatly overestimated, for it is almost certain that they prefer fresh food to carrion, and only take the latter when more agreeable food is scarce. This is mainly during winter and early spring when, in cold climates, no harm would be done if the carrion were allowed to lie uneaten.

During warm weather, when the decay of animal substances is more unpleasant and perhaps more dangerous to health, the Crow rarely touches a carcass at all, but any animal which dies at that time, together with any carcasses left from earlier in the season, are soon disposed of by insects and the natural processes of desiccation and decay.

In warm climates the black vultures and turkey buzzards render the services of Crows entirely superfluous. Undoubtedly there are times when Crows are serviceable in the removal of carrion, but in most cases there is no excuse for its presence in places where it can do any harm.

Food of the Fish Crow.

The food of the Fish Crow has been represented usually as consisting more strictly of marine products than that of the Common Crow; and it has been supposed also not to pull corn or feed on ripening grain, but to devote more time to fruit and perhaps to insects.

The examination of the twelve stomachs of Fish Crows does not bear out all these statements, for no one of the stomachs contained any trace of fish or any marine product, except a few bits of shell in one stomach. Only three of the stomachs contained any traces of insects (these mostly grasshoppers), while five contained carrion, and eight contained grain and berries. No one of these stomachs contained any seeds of poison ivy or sumach.

SUMMARY OF EVIDENCE FROM ALL SOURCES.

It appears, therefore, from a careful consideration of all testimony, published and unpublished, that—

I. Crows seriously damage the corn crop, and injure other grain crops usually to a less extent.

II. They damage other farm crops to some extent, frequently doing much mischief.

III. They are very destructive to the eggs and young of domestic fowls.

IV. They do incalculable damage to the eggs and young of native birds.

V. They do much harm by the distribution of seeds of poison ivy, poison sumach, and perhaps other noxious plants.

VI. They do much harm by the destruction of beneficial insects. On the other hand—

VII. They do much good by the destruction of injurious insects.

VIII. They are largely beneficial through their destruction of mice and other rodents.

IX. They are valuable occasionally as scavengers.

The careful examination of large numbers of stomachs, and the critical study of the insect food of the Crow, may change materially the present aspect of the question; but so far as the facts at present known enable a judgment to be formed, the harm which Crows do appears to far outweigh the good.

RESULTS IN DETAIL OF THE EXAMINATION OF STOMACHS OF THE COMMON CROW (*CORVUS AMERICANUS*).

[NOTE.—The following records of dissection are from examinations of stomachs preserved in alcohol and forwarded to the Department of Agriculture by the collectors whose names accompany the records in the list below. Unless otherwise stated the determinations of the various items of stomach contents have been made entirely by members of the Division, the writer being responsible for the larger part. The percentages of the food elements in each case are to be regarded simply as approximate; they are merely careful estimates, no exact measurement being practicable. As elsewhere stated, the remains of insects were referred to the Entomologist of the Department, for critical study, and a summary of his preliminary report has been given on a previous page.]

2648. Male. Schraalenburgh. N. J. January 2, 1886; 9.30 a. m. F. J. Dixon.
 Animal matter, 0 per cent.: vegetable, 90; gravel, etc., 6; indeterminate, 4.
 Stomach less than half full.
 Contents.—Fragments of corn, acorns, etc.: 3 bits of insect legs; fine mud-like matter not determined; a little sand and gravel.

2649. Female. Schraalenburgh, N. J. January 2, 1886; 10.30 a. m. F. J. Dixon. Animal matter, 7 per cent.; vegetable, 90; gravel, etc., 3. Stomach well filled.
Contents.—Remains of corn; pumpkin and cucumber seeds, and perhaps other seeds; remains of muscular fiber, probably from a mussel or clam as some of it was attached to a piece of a shell, apparently that of bivalve; a few bits of shell and a little sand; no remains of insects.
7012. Chester County, Pa. January 12, 1887. Dr. B. H. Warren. Animal matter, 25 per cent.; vegetable, 50; gravel, etc., 25. Stomach about two-thirds full.
Contents.—A few bits of corn (kernels), and a large amount of hulls of corn or other grain, with some other vegetable fiber; 4 seeds of poison ivy (*Rhus toxicodendron*); 2 vertebrae of small bird* and several fragments of bone of small fish*; 3 or 4 small beetles and a large quantity of other insect remains, and one spider; a good supply of coarse gravel.
7013. Chester County, Pa. January 15, 1887. Dr. B. H. Warren. Animal matter, 1 per cent.; vegetable, 90; gravel, etc., 9. Stomach about three-fourths full.
Contents.—One hundred and fifty-three seeds of poison ivy (*Rhus toxicodendron*), about 125 seeds of sumach (*Rhus glabra*); egg-case of a spider; insect remains; a fair amount of sand and gravel; a quantity of finely pulverized vegetable matter mixed with fine sand.
4432. Male. East Hartford, Conn. January 15, 1887; a. m. Willard E. Treat. Animal matter, 10 per cent.; vegetable, 75; gravel, etc., 15. Stomach well filled.
Contents.—Remains of kernels of corn, forming about 70 per cent. of entire stomach contents; about 15 seeds of common sumach (*Rhus*) and 1 seed of poison sumach (*Rhus venenata*); about 10 per cent. of bits of flesh and ligament of some animal, probably carrion; a large amount of clean sand without pebbles; no insect remains.
4433. Female. East Hartford, Conn. January 15, 1887; a. m. Willard E. Treat. Animal matter, 15 per cent.; vegetable, 10; gravel, etc., 75. Stomach less than half full.
Contents.—Three unknown seeds, probably of apple, pear, or quince; a small amount of vegetable matter like pulp of fruit; a single hog bristle and a number of bits of meat, probably carrion; a large amount of sand without any gravel or pebbles; no insect remains.
4434. Female. East Hartford, Conn. January 16, 1887; a. m. Willard E. Treat. Animal matter, 15 per cent.; vegetable, 10; gravel, etc., 75. Stomach about half full.
Contents.—A few skins of berries or seeds in small bits, and a little other fine vegetable debris; a single hog bristle and bits of animal tissue, probably carrion; about 2 per cent. of insect remains, all of a single insect; a large amount of sand, and two or three small pebbles.
4435. Male. East Hartford, Conn. January, 16, 1887; 2 p. m. Willard E. Treat. Animal matter, 5 per cent.; vegetable, 3; gravel, etc., 92. Stomach almost empty.
Contents.—One or two hog bristles and a few shreds of animal membrane, probably carrion; a few bits of hulls of corn or other grain; a little sand and many small fragments of some hard black mineral; no insect remains.
4436. Female. East Hartford, Conn. January 16, 1887; 2 p. m. Willard E. Treat. Animal matter, 35 per cent.; vegetable, 60; gravel, etc., 5. Stomach about half full.
Contents.—About 100 seeds of poison ivy (*Rhus toxicodendron*), and 7 seeds of common sumach (*Rhus*); about 35 per cent. of shreds and bits of animal membrane, probably carrion; a little sand, and five or six small pebbles; no insects.
4437. Male. East Hartford, Conn. January 16, 1887; 2 p. m. Willard E. Treat. Animal matter, 40 per cent.; vegetable, 10; gravel, etc., 50. Stomach almost empty.
Contents.—Two seeds of harmless sumach (*Rhus*) and a few hulls and skins of other seeds or grain; one hog bristle and a few shreds and small masses of muscle and tendon, probably carrion; sand without pebbles; no insects.

* These bones were identified by F. A. Lucas.

4438. Male. East Hartford, Conn. January 16, 1887; 2 p. m. Willard E. Treat.
Animal matter, 14 per cent.; vegetable, 85; gravel, etc., 1. Stomach well filled.
Contents.—Remains of about 20 kernels of corn, 9 or 10 of them nearly entire; about 80 seeds of harmless sumach (*Rhus*); one or two hog bristles and many shreds and bits of meat, probably carrion; a very little sand; no insects.
4450. Female. East Hartford, Conn. January 31, 1887; 10 a. m. Willard E. Treat.
Animal matter, 5 per cent.; vegetable, 48; gravel, etc., 47. Stomach well filled.
Contents.—Remains of kernels of corn, mostly hulls; one or two small shreds of meat (carrion?); a dozen or more caddis-fly cases and some of the legs of the larvæ [Tyler Townsend]; a large amount of sand and gravel.
4451. Male. East Hartford, Conn. January 31, 1887; 10 a. m. Willard E. Treat.
Animal matter, 50 per cent.; vegetable, 50; gravel, etc., 0. Stomach less than half full.
Contents.—Scraps and shreds of meat and animal membrane (carrion?); about 120 seeds of harmless sumach (*Rhus*), and other remains of the berries; no gravel or sand; no insects.
4452. Male. East Hartford, Conn. January 31, 1887; 10 a. m. Willard E. Treat.
Animal matter, 50 per cent.; vegetable, 42; gravel, etc., 8. Stomach well filled.
Contents.—Shreds and tendinous masses of animal matter, probably carrion; remains of a few acorns or chestnuts; 77 seeds of poison ivy (*Rhus toxicodendron*); about 175 seeds of harmless sumach (*Rhus*); a small amount of gravel and sand; no insects.
3059. Male. Sandy Spring, Md. February 4, 1887; a. m. H. H. Miller.
Animal matter, 0 per cent.; vegetable, 87; gravel, etc., 10; indeterminate, 3. Stomach well filled.
Contents.—Corn almost entirely, more than half of it in large pieces, some nearly entire kernels and a large quantity of hulls; about 10 per cent. of gravel and sand, the bulk of it being rusty quartz; a small amount (3 per cent.) of fine "mud," not identifiable; no insects.
4461. East Hartford, Conn. February 14, 1887; 10 a. m. Willard E. Treat.
Animal matter, 40 per cent.; vegetable, 50; gravel, etc., 10. Stomach well filled.
Contents.—Remains of corn and perhaps other grains, with a few bits of grass and hulls of seeds; about 60 seeds of harmless sumach (*Rhus*); apparently of two distinct species; 2 seeds of red cedar (*Juniperus*); a large amount of muscular fiber, fat, and sinews, probably carrion; sand and gravel; no insects.
4462. Female. East Hartford, Conn. February 14, 1887; 10 a. m. Willard E. Treat.
Animal matter, 5 per cent.; vegetable, 45; gravel, etc., 50. Stomach nearly empty.
Contents.—Remnants of corn and hulls; a few bits of acorn shells; a bit of skin (without hair) of some animal; a single hog bristle; a fair amount of fine sand, and two or three small pebbles; no insects.
4463. Female. East Hartford, Conn. February 14, 1887; 10 a. m. Willard E. Treat.
Animal matter, 1 per cent.; vegetable, 45; gravel, etc., 50; indeterminate, 4. Stomach about half full.
Contents.—About 100 seeds of harmless sumach (*Rhus*), and a considerable amount of hulls, skins, etc., of these or other seeds and fruits; a few minute bits of the hard parts of insects; a little very fine black "mud," not determined; sand, gravel, and bits of coke.
4464. Male. East Hartford, Conn. February 14, 1887; 10 a. m. Willard E. Treat.
Animal matter, 75 per cent.; vegetable, 0; gravel, etc., 25. Stomach almost empty.
Contents.—One hog bristle; a very little muscular fiber and sinew and some fat, doubtless all carrion; a small amount of fine sand; no insects.
3139. Male. West Goshen, Pa. February 15, 1886. Dr. B. H. Warren.
Animal matter, 5 per cent.; vegetable, 93; gravel, etc., 2. Stomach about half full.
Contents.—Remains of numerous kernels of corn; 6 seeds of sumach; a small bone from tarsus or carpus of some animal, apparently of the size of a dog or sheep; a single piece of slate about one-half inch long; no insects.

1331. Male. Washington, D. C. March 13, 1886; 4 p. m. Dr. A. K. Fisher.
Animal matter, 1 per cent.; vegetable, 97; gravel, etc., 2. Stomach well filled.
Contents.—Unidentified vegetable matter mainly: a few bits of corn or other grain, with some hulls, bits of grass, and what appears to be young sprouts of some vegetable; 3 or 4 small seeds not identified; a single claw of a crayfish and a few bits of insect remains; no pebbles and very little sand.
1379. Young. Saint Louis, Mo. May 23, 1885. Otto Widmann.
Animal matter, 99 per cent.; vegetable, 0; gravel, etc., 1.
Contents.—Many bones of frog; numerous fragments of insects; a very little sand.
5510. Nestling. Gainesville, Va. May 13, 1887; 5 p. m. Dr. A. K. Fisher.
Animal matter, 90 per cent.; vegetable, 0; gravel, etc., 0; indeterminate, 10. Stomach well filled.
Contents.—Mainly insects; a few bones of a small frog; about 10 per cent. of fine "mud," apparently a mixture of animal, vegetable, and mineral matter, but not determinable; no sand or gravel.
5511. Nestling. Gainesville, Va. May 13, 1887; 5 p. m. Dr. A. K. Fisher.
Animal matter, 90 per cent.; vegetable, 7; gravel, etc., 1; indeterminate, 2. Stomach about two-thirds full.
Contents.—Six or eight small pieces of vegetable matter, apparently bits of an acorn or chestnut; a few shreds of vegetable fiber; 2 or 3 minute bones of a fish; 3 bits of shell, probably of snail; a single small pebble and a few grains of sand; a large amount (nearly 90 per cent.) of insect remains, among which pieces of beetles are numerous; a small amount of fine mud-like material, probably from the insects.
2514. Adult female. Sing Sing, N. Y. June 30, 1886; 3 p. m. Dr. A. K. Fisher.
Animal matter, 1 per cent.; vegetable, 99; gravel, etc., 0. Stomach full.
Contents.—Mainly corn, one whole kernel and many large pieces, and a large amount of hulls and finely pulverized corn; 3 stones of cherries (cultivated); a few bits of black vegetable material like the shell of an acorn; a few bits of the hard parts of beetles; no sand or gravel.
2677. Young. Englewood, N. J. June 27, 1886; 5 p. m. F. M. Chapman.
Animal matter, 95 per cent.; vegetable, 5; gravel, etc., 0. Stomach well filled.
Contents.—Remains of a small bird, apparently an unfledged young; remains of insect larvæ and insects, but these *may* have come from the stomach of the young bird eaten by the Crow; a few bits of the hulls of corn, and other vegetable debris.
3045. Adult (?). Peterborough, Madison County, N. Y. June, 1886. G. S. Miller, jr.
Animal matter, 3 per cent.; vegetable, 95; gravel, etc., 2. Stomach well filled.
Contents.—Kernels of corn, oats, and a few of wheat, together with a large quantity of hulls, mainly of oats; a few small fragments of insects; 4 small pebbles, and a very little sand.
3769. Male. Immature. Peck's Island, New Jersey. July 1, 1886; noon. J. Percy Moore.
Animal matter, 15 per cent.; vegetable, 10; gravel, etc., 75. Stomach about half full.
Contents.—Mainly sand and bits of shell; two or three bits of seaweed and a very little other vegetable matter; 1 gasteropod shell about half an inch long; 3 or 4 joints of a crustacean's legs; hundreds of minute fish vertebrae, almost microscopic; about 5 per cent. of insect remains in very fine pieces.
2515. Male. Immature. Sing Sing, N. Y. July 1, 1886; 9 a. m. Dr. A. K. Fisher.
Animal matter, 99 per cent.; vegetable, 0; gravel, etc., 0; indeterminate, 1. Stomach about half full.
Contents.—Insects, mainly larvæ; a few bits of what appears to be bark or wood, but not positively identified; no sand or gravel.
2516. Male adult. Sing Sing, N. Y. July 1, 1886; 9 a. m. Dr. A. K. Fisher.
Animal matter, 2 per cent.; vegetable, 95; gravel, etc., 3. Stomach well filled.
Contents.—Nine cherry stones, with skins and pulp of about 3; fragments of corn or other grain, and the hulls of same; about 20 seeds of *Rubus* sp.; and 6 or 8 unknown seeds; a few remains of insects, apparently beetles; 5 small pebbles and a little sand.

Dr. Fisher says the cherry stones are from cherries which grow everywhere in the woods about Sing Sing, and probably have escaped from cultivation. They are very dark when ripe, almost black.

2517. Male adult. Sing Sing, N. Y. July 1, 1886; noon. Dr. A. K. Fisher.
Animal matter, 65 per cent.; vegetable, 33; gravel, etc., 2. Stomach well filled.
Contents.—Seven cherry stones (like those in No. 2516), and bits of skins and other débris of fruit; about a dozen seeds of *Rubus*, apparently the red raspberry (*R. strigosus*); large quantity of insect remains, one or two insects nearly entire; a very small amount of sand.
2518. Male adult. Sing Sing, N. Y. July 1, 1886; 1 p. m. Dr. A. K. Fisher.
Animal matter, 70 per cent.; vegetable, 30; gravel, etc., 0. Stomach full.
Contents.—Nineteen cherry stones (like those in No. 2516); a few bits of fruit skins and vegetable fiber; a very large amount of insect remains: four small vertebræ of small, tailed batrachian, perhaps a salamander (identified by F. A. Lucas).
2519. Male adult. Sing Sing, N. Y. July 2, 1886; 10.30 a. m. Dr. A. K. Fisher.
Animal matter, 60 per cent.; vegetable, 40; gravel, etc., 0. Stomach well filled.
Contents.—Six cherry stones (like those in No. 2516), and a very little other vegetable matter; bones and flesh of a small bullfrog (identified by F. A. Lucas). No trace of insects or gravel.
2520. Female adult. Sing Sing, N. Y. July 2, 1886; 1 p. m. Dr. A. K. Fisher.
Animal matter, 50 per cent.; vegetable, 50; gravel, etc., 0. Stomach little distended.
Contents.—Five stones of cherry (like those in No. 2516); remains of insects; no gravel.
2521. Female adult. Sing Sing, N. Y. July 2, 1886; 1.30 p. m. Dr. A. K. Fisher.
Animal matter, 60 per cent.; vegetable, 40; gravel, etc., 0. Stomach nearly empty.
Contents.—One cherry stone (like those found in No. 2516), and a single fragment of some other fruit stones; insect remains; no gravel.
2522. Female adult. Sing Sing, N. Y. July 2, 1886; 2.30 p. m. Dr. A. K. Fisher.
Animal matter, 33 per cent.; vegetable, 65; gravel, etc., 2. Stomach well filled.
Contents.—Four cherries, whole or nearly so, and stones of twelve more (like those in No. 2516), with a very little other vegetable matter; bones of a frog, forming about four-fifths of the animal matter, the remainder being fragments of insects; a single pebble and a very little sand.
2678. Young. Nigger Pond, Ramapo Mountains, N. J. July 4, 1886; 5 p. m. F. M. Chapman.
Animal matter, 10 per cent.; vegetable, 90; gravel, etc., 0. Stomach nearly empty.
Contents.—A few pieces of acorns, peas, or kernels of corn; three or four small berries, probably of the heath family, perhaps blueberries (*Vaccinium*); two or three pieces of animal matter, possibly bits of marine worms; two or three bones of small fish; no sand or gravel.
2679. Young. Nigger Pond, Ramapo Mountains, New Jersey. July 4, 1886; 5 p. m. F. M. Chapman.
Animal matter, 3 per cent.; vegetable, 97; gravel, etc., 0. Stomach about half full.
Contents.—Numerous fragments of the flesh of some nut, fruit, or grain, not determined, perhaps of acorn, as there are many fragments of shell resembling that of an acorn; 2 pistils of flowers nearly an inch long; a few bones of small fish; no trace of insects or gravel.
2866. Male adult (?). Peterborough, Madison County, N. Y. July 14, 1886. G. S. Miller, jr.
Animal matter, 60 per cent.; vegetable, 30; gravel, etc., 4; indeterminate, 6. Stomach well filled.
Contents.—Remains of oats (mainly the hulls); fine grass and some other vegetable fiber; bones and nearly all the teeth of a field-mouse (*Arvicola riparius*), forming about 25 per cent. of the whole stomach contents; about 30 per cent. of insect remains; about 6 per cent. of fine "mud" not identifiable.
4886. Young. Hillsborough, New Brunswick, July 15, 1886; 3 to 4 p. m. Jonathan Dwight, jr.
Animal matter, 10 per cent.; vegetable, 45; gravel, etc., 45. Stomach nearly empty.
Contents.—Remains of seeds and berries, two kinds of seeds not recognized; remains of insects; 10 pebbles; no sand.

4887. Male, young. Hillsborough, New Brunswick. July 16, 1886; 8 a. m. Jonathan Dwight, jr.
Animal matter, 35 per cent.; vegetable, 65; gravel, etc., 0. Stomach less than half full.
Contents.—A piece of moss about half an inch long; hulls of five or six raspberries; seven seeds of red raspberry (*Rubus strigosus*); remains of a large cutworm; no gravel or sand.
4888. Female, young. Hillsborough, New Brunswick. July 16, 1886; 8 a. m. Jonathan Dwight, jr.
Animal matter, 1 per cent.; vegetable, 99; gravel, etc., 0. Stomach less than half full.
Contents.—Hulls and a few seeds of raspberry; two small, unknown pods not yet ripe; twelve or fifteen very small seeds, possibly those of strawberries; a single fragment of some beetle; no gravel or sand.
4962. Male, immature. Hillsborough, New Brunswick. July 29, 1886; 5. p. m. Jonathan Dwight, jr.
Animal matter, 20 per cent.; vegetable, 80; gravel, etc., 0. Stomach about half full.
Contents.—A large amount of pulp and skins of some fruit not identified (the pulp looks like that of an early apple, but the skins are too thin); two stones of some species of *Prunus*, perhaps a beech plum; remains of insects, mainly (?) beetles, but one large cutworm; no gravel.
735. Immature. Sing Sing, N. Y. September 18, 1885; 10 a. m. Dr. C. Hart Merriam.
Animal matter, 5 per cent.; vegetable, 60; gravel, etc., 20; indeterminate, 15. Stomach well filled.
Contents.—Twenty-two stones of wild cherry (*Prunus serotina*); 9 of cornel (*Cornus* sp.), and 3 unidentified; also pulp of above berries; a few pieces of what appears to be an acorn or chestnut; various hard parts of insects.
1540. Alfred Centre, N. Y. September 20, 1885; a. m. F. S. Place.
Animal matter, 45 per cent.; vegetable, 53; gravel, etc., 2. Stomach full.
Contents.—Fragments of the "meat" of some nut or large seed; pieces of acorns or chestnuts; numerous fragments of fruit pulp, probably apple; many insect remains (45 per cent.); 5 small pebbles; no sand.
1541. Alfred Centre, N. Y. September 20, 1885; a. m. F. S. Place.
Animal matter, 40 per cent.; vegetable, 60; gravel, etc., 0. Stomach full.
Contents.—Seven stones of wild cherry (*Prunus serotina*); 5 or 6 triangular seeds (of *Polygonum* ?); skins and other vegetable matter from both the preceding, and some long vegetable fiber from some other plant; numerous insect remains; no sand or gravel.
2239. Male. Washington, D. C. September 7, 1886; 11 a. m. W. B. Barrows.
Animal matter, 0 per cent.; vegetable, 70; gravel, etc., 5; indeterminate, 25. Stomach almost empty.
Contents.—One grape seed; vegetable fiber finely divided; 2 or 3 bits of sand and gravel; fine mud-like material, not identifiable; no insects.
2240. Male. Washington, D. C. September 7, 1886; 11 a. m. F. A. Lucas.
Animal matter, 10 per cent.; vegetable, 80; gravel, etc., 10. Stomach about half full.
Contents.—Grape seeds and skins, with a little pulp and much vegetable fiber; other vegetable material not identifiable; 7 seeds of poison ivy; small amount of gravel; a few insect remains.
The grape seeds are undoubtedly those of cultivated grapes, as this bird and No. 2239 were shot near a vineyard, the owner of which complained of the great damage done by the Crows.
2698. Alfred Centre, N. Y. September 7, 1886. F. S. Place.
Animal matter, 95 per cent.; vegetable, 5; gravel, etc., 0. Stomach less than half full.
Contents.—One stone of wild cherry and a very little fine vegetable matter, probably from the fruit of the same; several grasshoppers and perhaps other insects; no gravel.
2242. Male. Shelter Island, New York. September 11, 1886; a. m. W. W. Worthington.
Animal matter, 10 per cent.; vegetable, 85; gravel, etc., 5. Stomach well filled.
Contents.—about 50 seeds of bay-berry or wax-berry (*Myrica cerifera*); hulls of corn or some other grain, with a few small bits of the grain; a little fine vegetable material, not identified; remains of the legs of a small crustacean; 4 small snail shells (marine); 2 vertebræ of small fish; a few fragments of insects; a little sand.

4587. Male. Shelter Island, New York. October 1, 1886; a. m. W. W. Worthington.
Animal matter, 25 per cent.; vegetable, 60; gravel, etc., 15. Stomach about half full.
Contents.—Fragments of acorns or chestnuts, and, perhaps, of some other seeds, but these mainly; remains of a crayfish; 4 or 5 minute bits of an insect; considerable sand, but no pebbles.
4588. Male. Shelter Island, New York. October 1, 1886; a. m. W. W. Worthington.
Animal matter, 0 per cent.; vegetable, 100; gravel, etc., 0. Stomach less than half full.
Contents.—Remains of a dozen or more kernels of corn; about 50 stones of bay-berry (*Myrica cerifera*); a single stone of some wild *Prunus*, probably the beach plum (*P. maritima*); 3 small claw tips of a crab or crayfish, probably taken as gravel (?); no insects.
2269. Female, adult. Sing Sing, N. Y. October 2, 1886; 3 p. m. Dr. A. K. Fisher.
Animal matter, 2 per cent.; vegetable, 95; gravel, etc., 3. Stomach full.
Contents.—Nineteen seeds of flowering dogwood (*Cornus florida*); 17 seeds of bay-berry (*Myrica cerifera*); bits of shell of chestnuts and large amount of chestnut "meat;" 8 vertebræ and other small bones of a small fish; minute bits of the shell of insects; little sand and gravel.
1439. Essex Junction, Vt. October 3, 1885; 10 a. m. Charles A. Davis.
Animal matter, 1 per cent.; vegetable, 10; gravel, etc., 89. Stomach nearly empty.
Contents.—Skin and pulp of a single fruit, perhaps a grape, but no seeds; large quantity of sand and gravel; minute fragments of the hard parts of insects.
1444. Winfield, N. Y. October 4, 1885; 10 a. m. O. P. Hitchings.
Animal matter, 5 per cent.; vegetable, 5; gravel, etc., 85; indeterminate, 5.
Contents.—A few bits of oats and perhaps other grain; a mixture of finely pulverized vegetable and mineral matter, forming a fine black mud; a large amount of sand and pebbles; a few fragments of insects.
2564. Female. Broadway, Queens County, N. Y. October 16, 1886; noon. William Dutcher.
Animal matter, 18 per cent.; vegetable, 75; gravel, etc., 7. Stomach well filled.
Contents.—Remains of acorns or chestnuts; remains of insects; gravel, including many bits of shell.
1141. Adult. Sing Sing, N. Y. October 18, 1885. Dr. A. K. Fisher.
Animal matter, 10 per cent.; vegetable, 75; gravel, etc., 10; indeterminate, 5. Stomach well filled.
Contents.—Fragments of acorns or chestnuts; about 50 seeds of poison sumach; remains of various insects; skins and pulp of a few berries.
1515. Watkins, N. Y. October 20, 1885; 8.45 a. m. H. C. Griswold.
Animal matter, 25 per cent.; vegetable, 25; gravel, etc., 50. Stomach about half full.
Contents.—Fragments of seeds, one of which appears to be that of a squash or melon; a little unidentifiable vegetable matter; remains of insects; sand and gravel.
3940. Male. Rockville, Conn. October 22, 1886. H. K. James.
Animal matter, 60 per cent.; vegetable, 35; gravel, etc., 5. Stomach full.
Contents.—Remains of some large seed, possibly corn or beans of some kind; large quantity of insect remains, mainly grasshoppers; small quantity of gravel, mostly bits of quartz, but one fair-sized garnet.
4080. Male. East Hartford, Conn. October 22, 1886; noon. C. C. Hanmer.
Animal matter, 2 per cent.; vegetable, 96; gravel, etc., 2. Stomach full.
Contents.—Remains of acorns or chestnuts almost entirely, and mainly without any bits of shell; a small amount of insect fragments in very small bits; a few pieces of charcoal, and a very little sand.
1460. Male. Redford, Mich. October 26, 1885; 7 a. m. (Killed over corn-field.) William J. Muldragh.
Animal matter, 0 per cent.; vegetable, 99; gravel, etc., 1. Stomach about half full.
Contents.—Mainly fragments of the pulp or flesh of some nut or berry, possibly acorns; 2 grape seeds; 3 small pebbles, no sand; no insect remains; no traces of corn.

1201. Male. Washington, D. C. October 30, 1885; 4 p. m. Dr. C. Hart Merriam.
Animal matter, trace; vegetable, 89 per cent.; gravel, etc., 5; indeterminate, 5.
Stomach well filled.
Contents.—Twenty or thirty kernels of corn in fragments; 21 stones of flowering dogwood (*Cornus florida*); 125 seeds of poison ivy; sand and gravel, and what appears to be fine mud; no trace of insect remains.
1202. Female. Washington, D. C. October 30, 1885, 4 p. m. Dr. C. Hart Merriam.
Animal matter, 1 per cent.; vegetable, 94; gravel, etc., 5. Stomach full.
Contents.—About 40 seeds of Virginia creeper (*Ampelopsis quinquefolia*); about 50 seeds of grapes (*Vitis*), at least 2 species; about 20 seeds of poison ivy, 1 of poison sumach, and 30 more unidentified; pulps and skins of grapes and other fruit: bits of sea-weed, grass, and unrecognizable vegetable matter; a few bits of insects; sand, gravel, 2 or 3 bits of mollusk shell, and single, worn claw of crayfish.
1250. Female. Washington, D. C. November 14, 1885; 11.30 a. m. Dr. A. K. Fisher.
Animal matter, 8 per cent.: vegetable, 90; gravel, etc., 2. Stomach full.
Contents.—Nine seeds of Virginia creeper (*Ampelopsis*); 12 stones of flowering dogwood (*Cornus florida*); fragments of about 5 kernels of corn; a few hairs of a small mammal (probably mouse); 1 very small gasteropod shell; bones of the head of a small fish; minute fragments of one insect.
2301. Adult. Washington, D. C. November 7, 1886; 4.30 p. m. H. W. Henshaw.
Animal matter, 10 per cent.; vegetable, 65; gravel, etc., 20; indeterminate, 5.
Stomach full.
Contents.—Remains of acorns, chestnuts, and perhaps other seeds: a single grape seed, and some hulls of corn or other grain, with much fine vegetable matter like saw-dust; a considerable amount of sand and gravel; remains (fine) of many insects.
1709. Male. Calhoun, Ga. November 28, 1885. R. Windsor Smith.
Animal matter, 75 per cent.; vegetable, 10; gravel, etc., 15.
Contents.—Twenty-four seeds of poison ivy; a small snake, 8 inches or more in length; a small snail (*Helix*); 1 very large spider; remains of many insects, constituting almost 40 per cent. of entire stomach contents; 4 or 5 pebbles of the size of kernels of corn, and some sand; a very little undetermined vegetable matter.
1518. Male. Watkins, N. Y. December 15, 1885; 4 p. m. H. C. Griswold.
Animal matter, 12 per cent.; vegetable, 63; gravel, etc., 25. Stomach full.
Contents.—Remains of corn, acorns, or chestnuts; some other seeds too much comminuted to determine; numerous insect remains; large quantity of gravel.
4600. Male. Rockaway Beach, Long Island, N. Y. December 17, 1885. Jonathan Dwight, jr.
Animal matter, 95 per cent.; vegetable, 0; gravel, etc., 5. Stomach nearly empty.
Contents.—The animal matter of one or more shell-fish (apparently a mussel and a barnacle, as bits of shell belonging to these are also contained); a very little sand; no insects.
1269. Female. Washington, D. C. December 2, 1885; 4 p. m. Dr. A. K. Fisher.
Animal matter, 1 per cent.; vegetable, 75; gravel, etc., 20; indeterminate, 4.
Contents.—Fragments of 1 or 2 acorns or chestnuts; large quantities of the "skin" or hulls of grain, apparently of kernels of corn; 30 seeds of poison ivy; large amount of sand and gravel; some vegetable fiber and mud; numerous but small fragments of the hard parts of insects.
1297. Female. Washington, D. C. December 17, 1885; found dead. Dr. A. K. Fisher.
Animal matter, 90 per cent.; vegetable, 2; gravel, etc., 8. Stomach about one-fourth full.
Contents.—One cocoon of some insect, and 2 smaller cocoons, or egg-bags of spider; 12 or 15 small fragments of much-worn bone, perhaps taken as "gravel;" a few bits of vegetable membrane, apparently epidermis of some grain; a very small amount of sand and gravel.
1298. Washington, D. C. December 17, 1885; found wounded. Dr. A. K. Fisher.
Animal matter, 5 per cent.; vegetable, 85; gravel, etc., 8; indeterminate, 2.
Contents.—Remains of 3 or 4 kernels of corn and the hulls of many more; 90 to 100 seeds of common sumach, apparently *Rhus glabra*; fragments of insects; gravel and sand; about 2 per cent. of fine mud-like material, not determined.

1299. Female. Washington, D. C. December 19, 1885; 4-5 p.m. Dr. A. K. Fisher. Animal matter, 1 per cent.; vegetable, 80; gravel, etc., 19. Stomach well filled.
Contents.—Seven seeds of harmless sumach; a large amount of vegetable matter, part of which may be bits of corn, acorns, etc., but the bulk seems more like sea-weed; a few fragments of the hard parts of insects; a large amount of gravel and fine sand, with 2 or 3 bits of shell.
1300. Male. Washington, D. C. December 19, 1885; 4-5 p.m. Dr. A. K. Fisher. Animal matter, 0 per cent.; vegetable, 90; gravel, etc., 10. Stomach well filled.
Contents.—Fragments of corn; 75 seeds of poison ivy; 60 seeds of common sumach and 1 seed of grape; gravel and bits of coal and brick; no insect remains.
1301. Male. Washington, D. C. December 19, 1885; 4-5 p.m. Dr. A. K. Fisher. Animal matter, trace; vegetable, 75 per cent.; gravel, etc., 24. Stomach well filled.
Contents.—"Mast" (i.e., acorns, chestnuts, and similar material), and large quantities of the epidermis of some grain, perhaps corn; 68 seeds of poison ivy; large amount of sand, gravel, etc.; minute fragments of insects.
1302. Male. Washington, D. C. December 19, 1885; 4-5 p.m. Dr. A. K. Fisher. Animal matter, 1 per cent.; vegetable, 85; gravel, etc., 14. Stomach well filled.
Contents.—Fragments of many kernels of corn, and two entire kernels; about 15 seeds of common sumach; 30 seeds of poison ivy; sand, gravel, and 5 or 6 good-sized bits of mother-of-pearl; a few small fragments of insects, and one insect nearly entire.
1303. Female. Washington, D. C. December 19, 1885; 4-5 p.m. Dr. A. K. Fisher. Animal matter 1 per cent.; vegetable, 94; gravel, etc. 5. Stomach well filled.
Contents.—About 20 whole kernels of corn, and fragments of as many more; 7 seeds of grape; about 60 seeds of common sumach; 5 seeds of poison ivy; gravel, coal, and sand; a few remains of insects.
1304. Male. Washington, D. C. December 19, 1885; 4-5 p.m. Dr. A. K. Fisher. Animal matter, 5 per cent.; vegetable, 70; gravel, etc., 25. Stomach about two-thirds full.
Contents.—About 10 entire kernels of corn (without skins), and as much more in fragments; 2 seeds of poison ivy; gravel, and bits of coal; about 5 per cent. of insect remains.
1311. Male. Washington, D. C. December 23, 1885; 4-5 p.m. Dr. A. K. Fisher. Animal matter, 10 per cent.; vegetable, 60; gravel, etc., 30. Stomach full.
Contents.—Particles of wheat or corn, 3 or 4 kernels in all; 100 seeds of common sumach; remains of sea-weeds and other vegetable matter; remains of a few small crustaceans (perhaps isopods); fragments of mussel shell with parts of the mussel attached; minute pieces of insects; considerable sand, and many pebbles.
1312. Male. Washington, D. C. December 23, 1885; 4-5 p.m. Dr. A. K. Fisher. Animal matter, 40 per cent.; vegetable, 50; gravel, etc., 10. Stomach full.
Contents.—One kernel of corn nearly entire, pieces of several more, and a large amount of hulls and other vegetable débris; 20 or 25 seeds of harmless sumach, apparently of two species; remains of a small crab or crayfish; 10 or 12 small bones of a fish; numerous remains of insects (grasshopper legs, etc.), and pieces of myriapods; sand, gravel, and pebbles, with 1 or 2 bits of shell.
1313. Male. Washington, D. C. December 23, 1885; 4-5 p.m. H. W. Henshaw. Animal matter, 1 per cent.; vegetable, 15; gravel, etc., 70; indeterminate, 14. Stomach full.
Contents.—Seed; and gravel mainly, with a little mud and fine vegetable refuse; traces of insects in addition to 2 or 3 small beetles entire; about forty seeds of common sumach, and about 80 of poison ivy; a few small bits of some grain, in all equal to about two kernels of wheat. Among the gravel was a small, worn, crayfish claw.
1314. Male. Washington, D. C. December 23, 1885; 4-5 p.m. H. W. Henshaw. Animal matter, 10 per cent.; vegetable, 60; gravel, etc., 30. Stomach full.
Contents.—Pieces of corn, perhaps 4 or 5 kernels in all; bits of grass, hulls, vegetable fiber of various kinds, and considerable fine "mud," apparently all vegetable; 6 or 8 pieces of the carapace of a crayfish; fragments of mussel shell (*Unio* ?); many small bones of common mouse (*Mus musculus*), with some of the teeth; many fragments of insects, much comminuted; sand, gravel, charcoal, and one or two imperfect snail shells.

1315. Male. Washington, D. C. December 23, 1885; 4-5 p. m. H. W. Henshaw. Animal matter, 1 per cent.; vegetable, 97; gravel, etc., 2. Stomach well filled.
Contents.—Mainly kernels of corn whole or in fragments, and the hulls of same; bits of the shell of acorns and a few bits of the kernel of same; 4 seeds of poison ivy; 1 seed of bind-weed, (*Polygonum* ?); about 100 very small, black seeds; a very few fragments of insects; a very little gravel or sand.
1316. Female. Washington, D. C. December 23, 1885; 4-5 p. m. H. W. Henshaw. Animal matter, 3 per cent.; vegetable, 72; gravel, etc., 25. Stomach about half full.
Contents.—A few bits of corn and hulls of same; pieces of grass and very fine vegetable débris, part of it apparently the shell of some bony seed; 4 or 5 small beetles, and minute portions of hard parts of others; sand and gravel; small tuft of mammal's hair, probably of cat or dog; fragments of one or more legs of crayfish; eight or ten kernels of wild rice (*Zizania aquatica*); 2 unknown seeds.
1317. Female. Washington, D. C. December 23, 1885; 4-5 p. m. H. W. Henshaw. Animal matter, 2 per cent.; vegetable, 83; gravel, etc., 15. Stomach about three-fourths full.
Contents.—Mainly pieces of corn and hulls of same; 123 seeds of poison ivy; a little fine vegetable matter not determined; minute pieces of the hard parts of insects; gravel and fine sand form about 15 per cent. of the entire contents.
2528. Male. Washington, D. C. December 25, 1886. F. A. Lucas. Animal matter, 5 per cent.; vegetable, 50; gravel, etc., 25; indeterminate, 20. Stomach well filled.
Contents.—Remains of acorns, chestnuts, and similar material, in small pieces; about 20 per cent. of other vegetable material, similar in color, but like fine mud, and probably part vegetable and part sand; bones of a small fish, forming 4 or 5 per cent. of contents; a single leg of some insect, and 2 or 3 other minute insect fragments; gravel, consisting mainly of mother-of-pearl and fine sand.
4117. Female. East Hartford, Conn. December 15, 1886; 10 a. m. C. C. Hanmer. Animal matter, 15 per cent.; vegetable, 60; gravel, etc., 20; indeterminate, 5. Stomach well filled.
Contents.—Remains of acorns, both shells and "meat;" a few bits of thorn-apple (*Cratægus*), but no seeds; bits of grass and finely divided vegetable matter; a considerable amount of fine, dark hair, probably of mouse; perhaps 5 per cent. of insect remains; a large amount of pebbles and sand; about 5 per cent. of fine "mud" not determined.

RESULTS IN DETAIL OF THE EXAMINATION OF STOMACHS OF THE FISH CROW (*CORVUS OSSIFRAGUS*).

1332. Male. Washington, D. C. March 16, 1886; 4 p. m. Dr. A. K. Fisher. Animal matter, 5 per cent.; vegetable, 93; gravel, etc., 2. Stomach full.
Contents.—Eleven seeds of cat-brier (*Smilax glauca*); 2 seeds of sour gum (*Nyssa multiflora*); a few bits of corn and many hulls, together with other fibrous vegetable matter; 2 small masses of animal fiber, apparently flesh of some mammal; single feather, probably of chicken; a very little sand, etc.; no insect remains.
1333. Female. Washington, D. C. March 16, 1886; 4 p. m. Dr. A. K. Fisher. Animal matter, 10 per cent.; vegetable, 88; gravel, etc., 2. Stomach about half full.
Contents.—Two or three kernels of corn, and hulls of more, with some other vegetable matter; bone of some mammal (probably taken with gravel); 2 or 3 feathers, kind not determined; among the gravel was a bit of shell (of *Unio*?) and several bits of egg-shell (hen's); no insects.
1334. Female. Washington, D. C. March 16, 1886; 4 p. m. Dr. A. K. Fisher. Animal matter, 98 per cent.; vegetable, trace; gravel, etc., 2. Stomach about one-third full.
Contents.—A mass of meat and sinews, doubtless carrion; a very few small bits of coal and sand, and one or two bits of egg-shell (hen's); a very few vegetable fibers, perhaps of grass; no insects.

1335. Male. Washington, D. C. March 16, 1886; 4 p. m. Dr. A. K. Fisher.
Animal matter, 75 per cent.; vegetable, 5; gravel, etc., 20. Stomach about one-third full.
Contents.—Shreds of meat, and strips and small sheets of animal membrane, not identifiable, doubtless carrion; a few bits of grass and woody fiber; particles of sand and pebbles, and numerous small pieces of egg-shell (hen's), together with fragments of a mussel shell (*Unio* ?), and 2 small bones, apparently mammalian, but discolored and probably taken as gravel; no insects.
1336. Washington, D. C. March 16, 1886; 4 p. m. Dr. A. K. Fisher.
Animal matter, 5 per cent.; vegetable, 75; gravel, etc., 5; indeterminate, 15. Stomach about half full.
Contents.—Mainly remnants of oats with the hulls, and corn in fine pieces; a little meat fiber; a few downy feathers; 3 or 4 unknown seeds; some sand and gravel and bits of egg-shell (hen's); no insects.
657. Female, immature. Sing Sing, N. Y. September 10, 1885; 6.30 a. m. Dr. A. K. Fisher.
Animal matter, 0; vegetable, 100. Stomach half full.
Contents.—Fragments of oats, pieces of acorns or chestnuts; unrecognizable vegetable matter; no traces of animal food.
2529. Male. Washington, D. C., November 1, 1886. F. A. Lucas.
Animal matter, 10 per cent.; vegetable, 90; gravel, etc., 0. Stomach about two-thirds full.
Contents.—Seeds, pulp, and skins of about 20 poke-berries (*Phytolacca decandra*); remains of two or three grasshoppers, and perhaps other insects; no gravel.
2284. Male. Washington, D. C., November 1, 1886; 3 p. m. F. A. Lucas.
Animal matter, 65 per cent.; vegetable, 30; gravel, etc., 5. Stomach well filled.
Contents.—Five grape seeds, pieces of grape skins, many fragments of grasshoppers (and other insects ?), a little sand, bits of egg-shell, one scale from shell of a tortoise, probably all taken as gravel.
2302. Female. Washington, D. C., November 7, 1886; 4.30 p. m. H. W. Henshaw.
Animal matter, 35 per cent.; vegetable, 65; gravel, etc., 0. Stomach well filled.
Contents.—Seeds and skins of about 20 small grapes, apparently "frost grapes" (*Vitis cordifolia*); about 130 seeds of poke-berry (*Phytolacca*); heads, wings, and legs of several grasshoppers; no gravel or sand except one small piece of mica.
2583. Male. Washington, D. C., November 19, 1886; 9.30 a. m. William Dutcher.
Animal matter, 50 per cent.; vegetable, 50; gravel, etc., 0. Stomach nearly empty.
Contents.—Three seeds of poke-berry and one or more skins of same; 3 seeds of red cedar (*Juniperus virginiana*); no insect remains; no gravel.
1310. Male. Washington, D. C. December 23, 1885; 4-5 p. m. Dr. A. K. Fisher.
Animal matter, 1 per cent.; vegetable, 96; gravel, etc., 3. Stomach about half full.
Contents.—Two or three grains of wheat, and many fragments of this or other grain; 2 seeds of Virginia juniper; many fragments of some black, bony seed, looking much like ground coffee; 2 or 3 small "pin feathers" still inclosed in the sheath except at tip; many small fragments of egg-shell (hen's); a very little sand, and 1 bit of stone; no trace of insect remains.
1318. Female. Washington, D. C. December 25, 1885; 4-5 p. m. Dr. A. K. Fisher.
Animal matter, 50 per cent.; vegetable, 50; gravel, etc., 0.
Contents.—Meat (probably carrion); 8 seeds of sour gum (*Nyssa multiflora*); 4 seeds of flowering dogwood, 1 seed of grape, 5 seeds of hackberry (*Celtis occidentalis*), 2 unknown seeds; no gravel or insect remains.

THE ROSE-BREADED GROSBEEK

(*Habia ludoviciana*).

AN ENEMY TO THE COLORADO BEETLE OR POTATO BUG.

As early as 1873 Mr. Henry H. Mapes noted the fact that the Rose-breasted Grosbeak fed freely on potato bugs near Kalamazoo, Mich. (*Am. Naturalist*, VII, 493). In the same journal, in 1875, W. F.

Bundy made the following statement with regard to this habit of the Grosbeak at Jefferson, Wis.:

I noticed last summer that great numbers of the Colorado potato beetle were destroyed by the Rose-breasted Grosbeaks. The farmers hold these birds in great favor, and are very careful to prevent their destruction. They were so abundant in this region last summer as to hold in check the vast army of these ravagers of the potato crop. (*Am. Naturalist*, ix, p. 375.)

Since this time the habit has been noticed repeatedly throughout the country, and in 1885 reports of this kind were received at the Department of Agriculture from the states of Connecticut, Illinois, Iowa, Michigan, Minnesota, New Jersey, and New York.

In 1886 Prof. F. E. L. Beal, formerly of Ames, Iowa, wrote as follows:

The Rose-breasted Grosbeak feeds upon the Colorado potato beetle in all its stages. I observed this habit in central Iowa, and noticed that each year it became more general, the birds of this species seeking the potato-field more and more each season. I observed one small field near my house that was much infested with the beetles, but the birds found it, and in a few weeks I searched the field but could not discover a single beetle, young or old.

From many reports received since, we select the following:

From M. R. Steele, Decorah, Iowa:

As the Rose-breasted Grosbeak raises only one brood, and devours many Colorado potato bugs, which many other birds do not eat, it deserves special encouragement. Farmers know its value.

From George H. Selover, Lake City, Minn.

The Rose-breasted Grosbeak is thought, and with reason, too, to be beneficial on account of its destroying the potato bug. It is the only bird I have observed that would come under this head. It destroys the common potato bug very extensively; so extensively, in fact, as to deserve the name of "Potato-bug bird" given it in so many localities.

From E. M. Hancock, Waukon, Iowa:

The Rose-breasted Grosbeak has more than made amends for its pea-stealing by its determined warfare upon the Colorado potato beetle, helping very materially to keep down this pest.

From Orville L. Larkin, East Otto, N. Y.:

I have been observing the habits of the Rose-breasted Grosbeak and would say that it is a decided enemy of the Colorado beetle, devouring both the larva and the mature beetle, shucking the wings off from the latter much as the canary does the hulls from bird seed.

From B. T. Gault, Chicago, Ill.:

The Rose-breasted Grosbeak may be regarded as the farmer's friend on account of its fondness for the Colorado potato beetle and chinch-bug.

These reports show that this bird already is a valuable friend of the farmer and is deserving of the most careful protection and encouragement. The little harm which it is known to do—solely the destruction of a few peas, small fruits, and buds or blossoms—is trifling in comparison with the value of its services in the potato-field. Moreover it is one of the most beautiful of all our native birds, and in addition to its striking plumage has a pleasant warbling song which is constantly heard during the nesting season.

In some of our smaller Eastern cities this species nests freely in the shade trees and hedges along the streets, as well as in the gardens and orchards about the houses; and doubtless in most cases all that is needed in order to secure its presence more generally is the provision of suitable trees and shrubbery for nests, and the assurance that its young and eggs will not be molested.